

Title: Tutorial 3B: Bootstrapping conserved currents

Speakers: Ning Su

Collection: Mini-Course of Numerical Conformal Bootstrap

Date: April 26, 2023 - 3:30 PM

URL: <https://pirsa.org/23040144>

Preparations

<https://gitlab.com/AikeLiu/Bootstrap-Mini-Course/-/blob/master/Installation.md>

Set up automatic SSH, see section "Automatic SSH".

Compile executables, see section "Install SDPB and related packages".

To call the executables on the Perimeter cluster:

`scalar_blocks_mod : "mpirun --bind-to none -n 1 /gpfs/nsu2/bootstrap_bin/scalar_blocks_mod --num-threads 40"`

`sdp2input_mod : "mpirun -n 40 --bind-to none /gpfs/nsu2/bootstrap_bin/sdp2input_mod_2.5.0"`

`SDPB : "mpirun -n 40 /gpfs/nsu2/bootstrap_bin/sdpb2.5.1 --procsPerNode 40"`

Simpleboot git repository: <https://gitlab.com/bootstrapcollaboration/simpleboot.git>

set up $O(N)$ single correlator bootstrap from scratch

Bootstrap equations

Crossing equations :

$$\sum_S \lambda_0^2 V_{S,\Delta,l} + \sum_{T^+} \lambda_0^2 V_{T,\Delta,l} + \sum_{A^-} \lambda_0^2 V_{A,\Delta,l} = 0$$



PI_Symmetry (n...



Tutorial3B_note...



simpleboot_tut...



Bootstrapping ...



start



ENG

9:35 PM

Wednesday

4/26/2023

正在共享桌面 | 停止共享

文件 主页 共享 查看

固定到快速访问 复制 粘贴 剪切 复制路径 粘贴快捷方式 移动到 复制到 删除 重命名 新建项目 轻松访问 新建文件夹 属性 打开 历史记录 全部选择 全部取消 反向选择

OneDrive - Personal > talks > Perimeter_minicourse > slides > Tutorial3B_fresh > testrun

名称	状态	修改日期	类型	大小
autoboot	✓	4/26/2023 9:36 PM	文件夹	
Scripts	✓	4/26/2023 9:36 PM	文件夹	
simpleboot_manual.nb	✓	4/26/2023 3:43 PM	Wolfram Noteb...	78 KB
testrun.nb	✓	4/26/2023 9:37 PM	Wolfram Noteb...	1 KB
Tutorial3B_note.nb	✓	4/26/2023 9:01 PM	Wolfram Noteb...	14 KB

5 个项目 选中 1 个项目 12 字节 在此设备上可用

Windows Taskbar: PI_Symmetry (n... | Tutorial3B_note... | config.m - Wolf... | Welcome to W... | simpleboot_tut... | 9:37 PM Wednesday 4/26/2023

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1. config.m
2. Tutorial3B_note.nb
3. Tutorial3B_note.nb
4. Tutorial3B_note.nb
5. simplebo...anual.nb

WOLFRAM MATHEMATICA 11
Version: 11.1.1.0

```
In[ ]:= (* Load simpleboot package. Don't modify this cell *)
GetFileDirectory[]:=If[$InputFileName==="",NotebookDirectory[],DirectoryName@$InputFileName];
$MainFileScriptQ=$InputFileName!="";
AppendTo[$Path,GetFileDirectory[]];
SetDirectory@GetFileDirectory[];

Get["./Scripts/config.m"];
Get[ReconfigCmd@[Local.PackageDirectory]/Bootstrapper.m];

Bootstapper packages Loaded. Version : 4.0
MMA Precision set to 200.

Cluster$SetConfig["[Cluster.ProjectDirectory]", "Proj_Tutorial3B_testrun"];
```



Windows taskbar showing the Start button, task view icon, and several open applications: simpleboot_tutori..., Bootstrapping Hei..., Packages, PI_Symmetry (n..., Tutorial3B_note..., config.m - Wolf..., testrun.nb * - W..., and simpleboot_ma... The system tray on the right includes network, volume, and language (ENG) icons, along with the date and time: 9:42 PM Wednesday 4/26/2023. A zoom level indicator shows 100%.


```
In[1]:= (* Load simpleboot package. Don't modify this cell *)
GetFileDirectory[]:=If[$InputFileName=== "", NotebookDirectory[], DirectoryName@$InputFileName];
$MainFileScriptQ=$InputFileName!="";
AppendTo[$Path, GetFileDirectory[]];
SetDirectory@GetFileDirectory[];

Get["./Scripts/config.m"];
Get[ReconfigCmd@"[Local.PackageDirectory]/Bootstrapper.m"];

Bootstapper packages Loaded. Version : 4.0
MMA Precision set to 200.

In[10]:= Cluster$SetConfig["[Cluster.ProjectDirectory]", "Proj_Tutorial3B_testrun"];
CheckDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]"];
```

File Edit Insert Format Cell Graphics

`Get[ReconfigCmd@{LocalPackageDirectory}/Bootstrapper.m];`

Bootstapper packages Loaded. Version : 4.0

MMA Precision set to 200.

```

In[10]:= Cluster$SetConfig["[Cluster.ProjectDirectory]", "Proj_Tutorial3B_testrun"];
         CheckDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]"];

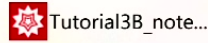
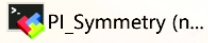
```

crossing vector

```

crossvecobj = {"VBlock" → {
  op[op, "E", 1, 1] → { (* crossing vector Veven for Z2 even, spin even channel *)
},
  "VBlock$Single" → {}, (* terms has external operators as intermediate operator *)
  "VBlock$Identity" → {{Fp[sig, sig, sig, sig, 0]}}, (* crossing vector for identity *)
  "VBlock$Deriv" → {"odd"}, (* indicate the 5 compenents are even/odd under u<->v exchange *)
  "VBlock$External" → {"sig"} (* the name of external operators as String *)
};

```



SDPB : `"mpirun -n 40 /gpfs/nsu2/bootstrap_bin/sdpb2.5.1 --` File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

Simpleboot git repository: <https://gitlab.com/bootstrapcollabc>

set up $O(N)$ single correlator bootstrap from sc

Bootstrap equations

Crossing equations :

$$\sum_{S^+} \lambda_0^2 V_{S,\Delta,l} + \sum_{T^+} \lambda_0^2 V_{T,\Delta,l} + \sum_{A^-} \lambda_0^2 V_{A,\Delta,l} = 0$$

$$V_{S,\Delta,l} = \begin{pmatrix} 0 \\ F_{\Delta,l}^- \\ F_{\Delta,l}^+ \end{pmatrix}, \quad V_{T,\Delta,l} = \begin{pmatrix} F_{\Delta,l}^- \\ (1 - \frac{2}{N}) F_{\Delta,l}^- \\ -(1 + \frac{2}{N}) F_{\Delta,l}^+ \end{pmatrix}, \quad V_{A,\Delta,l} = \begin{pmatrix} F_{\Delta,l}^- \\ -F_{\Delta,l}^- \\ F_{\Delta,l}^+ \end{pmatrix}$$

Note : In simpleboot, the default definition of conformal block is in row 5. Therefore there is a $(-1)^l$ difference for $V_{A,\Delta,l}$.

Bound Δ_s v.s. Δ_ϕ

Scan the range $\Delta_\phi \in (0.510, 0.53)$, $\Delta_s \in (1.0, 2)$.

crossing vector

$$\text{crossvecobj} = \{ \text{"VBlock"} \rightarrow \{$$

$$\text{op}[\text{op}, \text{"S"}, 1, 1] \rightarrow \begin{pmatrix} \theta \\ F[v, v, v, v] \\ H[v, v, v, v] \end{pmatrix},$$

$$\text{op}[\text{op}, \text{"T"}, 1, 1] \rightarrow \begin{pmatrix} F[v, v, v, v] \\ (1 - \frac{2}{\text{ngroup}}) F[v, v, v, v] \\ -(1 + \frac{2}{\text{ngroup}}) H[v, v, v, v] \end{pmatrix},$$

$$\vdots$$

$$\text{op}[\text{op}, \text{"A"}, 1, -1] \rightarrow \begin{pmatrix} F[v, v, v, v] \\ -F[v, v, v, v] \\ H[v, v, v, v] \end{pmatrix}$$

$$\},$$

"VBlock\$Single" \rightarrow {}, (* terms has external operators as intermediate operator *)

"VBlock\$Identity" \rightarrow {{Epsilon sigma sigma sigma 0}}

Windows taskbar showing open applications: simpleboot_tutori..., Bootstrapping Hei..., testrun, PI_Symmetry (n..., Tutorial3B_note..., config.m - Wolf..., testrun.nb - Wo..., simpleboot_ma... . System tray shows time 9:49 PM, date Wednesday 4/26/2023, and language ENG.

SDPB : `"mpirun -n 40 /gpfs/nsu2/bootstrap_bin/sdpb2.5.1 --`

Simpleboot git repository: <https://gitlab.com/bootstrapcollabc>

set up $O(N)$ single correlator bootstrap from sc

Bootstrap equations

Crossing equations :

$$\sum_S \lambda_0^2 V_{S,\Delta,l} + \sum_T \lambda_0^2 V_{T,\Delta,l} + \sum_A \lambda_0^2 V_{A,\Delta,l} = 0$$

$$V_{S,\Delta,l} = \begin{pmatrix} 0 \\ F_{\Delta,l}^- \\ F_{\Delta,l}^+ \end{pmatrix}, \quad V_{T,\Delta,l} = \begin{pmatrix} F_{\Delta,l}^- \\ (1 - \frac{2}{N}) F_{\Delta,l}^- \\ -(1 + \frac{2}{N}) F_{\Delta,l}^+ \end{pmatrix}, \quad V_{A,\Delta,l} = \begin{pmatrix} F_{\Delta,l}^- \\ -F_{\Delta,l}^- \\ F_{\Delta,l}^+ \end{pmatrix}$$

Note : In simpleboot, the default definition of conformal block is in row 5. Therefore there is a $(-1)^l$ difference for $V_{A,\Delta,l}$.

Bound Δ_s v.s. Δ_ϕ

Scan the range $\Delta_\phi \in (0.510, 0.53)$, $\Delta_s \in (1.0, 2)$.

$$\begin{aligned} \text{op}[\text{op}, "S", 1, 1] &\rightarrow \begin{pmatrix} F[v, v, v, v] \\ H[v, v, v, v] \end{pmatrix}, \\ \text{op}[\text{op}, "T", 1, 1] &\rightarrow \begin{pmatrix} F[v, v, v, v] \\ (1 - \frac{2}{\text{ngroup}}) F[v, v, v, v] \\ -(1 + \frac{2}{\text{ngroup}}) H[v, v, v, v] \end{pmatrix}, \\ \text{op}[\text{op}, "A", 1, -1] &\rightarrow \begin{pmatrix} F[v, v, v, v] \\ -F[v, v, v, v] \\ H[v, v, v, v] \end{pmatrix} \end{aligned}$$

"VBlock\$Single" $\rightarrow \{ \}$, (* terms has external operators as intermediate operator *)

$$\text{"VBlock$Identity"} \rightarrow \begin{pmatrix} 0 \\ F_p[v, v, v, v, 0] \\ \mathbb{1} \end{pmatrix},$$

(* crossing vector for identity *)

"VBlock\$Deriv" $\rightarrow \{ \{ "odd" \} \}$,

(* indicate the 5 components are even/odd under $u \leftrightarrow v$ exchange *)

Windows taskbar showing open applications: simpleboot_tutori..., Bootstrapping Hei..., testrun, Tutorial3B_note..., config.m - Wolf..., testrun.nb * - W..., simpleboot_ma... The system tray shows the time as 9:52 PM on Wednesday, 4/26/2023, with language set to ENG.

SDPB : `"mpirun -n 40 /gifs/nsu2/bootstrap_bin/sdpb2.5.1 --`

Simpleboot git repository: <https://gitlab.com/bootstrapcollabc>

set up $O(N)$ single correlator bootstrap from sc

Bootstrap equations

Crossing equations :

$$\sum_S \lambda_0^2 V_{S,\Delta,l} + \sum_T \lambda_0^2 V_{T,\Delta,l} + \sum_{A^-} \lambda_0^2 V_{A,\Delta,l} = 0$$

$$V_{S,\Delta,l} = \begin{pmatrix} 0 \\ F_{\Delta,l}^- \\ F_{\Delta,l}^+ \end{pmatrix}, \quad V_{T,\Delta,l} = \begin{pmatrix} F_{\Delta,l}^- \\ (1 - \frac{2}{N}) F_{\Delta,l}^- \\ -(1 + \frac{2}{N}) F_{\Delta,l}^+ \end{pmatrix}, \quad V_{A,\Delta,l} = \begin{pmatrix} F_{\Delta,l}^- \\ -F_{\Delta,l}^- \\ F_{\Delta,l}^+ \end{pmatrix}$$

Note : In simpleboot, the default definition of conformal block is in row 5. Therefore there is a $(-1)^l$ difference for $V_{A,\Delta,l}$.

Bound Δ_s v.s. Δ_ϕ

Scan the range $\Delta_\phi \in (0.510, 0.53)$, $\Delta_s \in (1.0, 2)$.

$$\text{op}[\text{op}, "T", 1, 1] \rightarrow \begin{pmatrix} (1 - \frac{2}{\text{ngroup}}) F[v, v, v, v] \\ - (1 + \frac{2}{\text{ngroup}}) H[v, v, v, v] \end{pmatrix},$$

$$\text{op}[\text{op}, "A", 1, -1] \rightarrow \begin{pmatrix} F[v, v, v, v] \\ -F[v, v, v, v] \\ H[v, v, v, v] \end{pmatrix}$$

},

"VBlock\$Single" \rightarrow {}, (* terms has external operators as intermediate operator *)

$$\text{"VBlock$Identity"} \rightarrow \begin{pmatrix} \theta \\ Fp[v, v, v, v, \theta] \\ Hp[v, v, v, v, \theta] \end{pmatrix},$$

(* crossing vector for identity *)

$$\text{"VBlock$Deriv"} \rightarrow \begin{pmatrix} \text{"odd"} \\ \text{"odd"} \\ \text{"even"} \end{pmatrix},$$

(* indicate the 5 components are even/odd under $u \leftrightarrow v$ exchange *)

"VBlock\$External" \rightarrow {"sig"}

AutoCB3\$Condition uses the "dim" and "lset" in block

GapConfiguration_List : a list similar to GapConfigura numbers.

SDP template

SDP template is a user defined data with the format:

SDPData[objective,normalization,conditions]

objective,normalization : produced by AutoCB3\$Vect

conditions : produced by AutoCB3\$Condition

Function : AutoCB3\$SaveSDPTemplate

AutoCB3\$SaveSDPTemplate

AutoCB3\$SaveSDPTemplate[templateSDP] : save a
AutoCB3\$SaveSDPTemplate[templateSDP, filename]

Function : AutoCB3\$GenerateSDP

Scanner

block spec

```
blockConfObj = {"dim" -> 3, "lmax" -> 11, "x" -> 12, "rN" -> 48,
  "lset" -> Range[0, 20] ~ Join ~ {49, 52}};
```

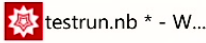
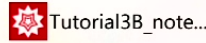
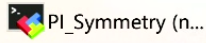
```
In[12]:= blockConfObj={"dim"->3,"lmax"->5,"x"->12,"rN"->48,"lset"->{0,1,2,3,4,5}};
```

initialize simpleboot

```
In[14]:= AutoCB3$Init[crossvecobj,blockConfObj];
```

SDP template

```
mySDPTemplate[] := Module[
  {}]
```



AutoCB3\$Condition[prefactor, cross
gap, spinset.

Example : AutoCB3\$Condition[Pre

AutoCB3\$Condition[GapConfigurat
AutoCB3\$Condition[GapConfigurat

GapConfigurationFunc :

GapConfiguration[dim_, lset_] : a us
following format:

{channel, gap, spin} : demand α
 Δ unitary[dim, /]

{channel, IndividualOperator[Δ 0], spi
{channel, IndividualOperator[Δ 0, ope
{channel, IntervalPositivity[Δ min, Δ m

AutoCB3\$Condition uses the "dim"

GapConfiguration_List : a list simila
numbers.

```
blockConfObj = {"dim" -> 3, "Delta_max" -> 11, "x" -> 12, "rN" -> 48,  
"lset" -> Range[0, 20] ~ Join ~ {49, 52}};
```

```
In[12]:= blockConfObj={"dim"->3,"Delta_max"->5,"x"->12,"rN"->48,"lset"->{0,1,2,3,4,5}};
```

initialize simpleboot

```
In[14]:= AutoCB3$Init[crossvecobj, blockConfObj];
```

SDP template

```
In[15]:= ObjGet[crossvecobj, "VBlock"] [[All, 1]]
```

```
Out[15]= {op[op, S, 1, 1], op[op, T, 1, 1], op[op, A, 1, -1]}
```

```
GapConfiguration[dim_, lset_] := {  
  {op[op, "S", 1, 1]}  
};
```

```
mySDPTemplate[] := Module[
```

`AutoCB3$Condition[prefactor, cross
gap, spinset.`

Example : `AutoCB3$Condition[Pre`

`AutoCB3$Condition[GapConfigurat
AutoCB3$Condition[GapConfigurat`

GapConfigurationFunc :

`GapConfiguration[dim_, lset_]` : a us
following format:

`{channel, gap, spin}` : demand α
 `Δ unitary[dim, l]`

`{channel, IndividualOperator[Δ 0], spi
{channel, IndividualOperator[Δ 0, ope
{channel, IntervalPositivity[Δ min, Δ m`

`AutoCB3$Condition` uses the "dim"

`GapConfiguration_List` : a list simila
numbers.

initialize simpleboot

```
In[14]:= AutoCB3$Init[crossvecobj, blockConfObj];
```

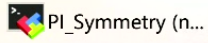
SDP template

```
In[15]:= ObjGet[crossvecobj, "VBlock"] [[All, 1]]
```

```
Out[15]= {op[op, S, 1, 1], op[op, T, 1, 1], op[op, A, 1, -1]}
```

```
GapConfiguration[dim_, lset_] := {  
  {op[op, "S", 1, 1], Delta$s, {0}},  
  {op[op, "S", 1, 1],  $\Delta$ unitary[dim, l], Select[lset, EvenQ[#] && # > 0 &]},  
};
```

```
mySDPTemplate[] := Module[  
  {objective, normalization, conditions},  
  objective = AutoCB3$Vector[CrossVec["zero"]];  
  normalization = AutoCB3$Vector[CrossVec["identity"]];  
  
  conditions
```



`AutoCB3$Condition[prefactor, cross
gap, spinset.`

Example : `AutoCB3$Condition[Pre`

`AutoCB3$Condition[GapConfigurat
AutoCB3$Condition[GapConfigurat`

GapConfigurationFunc :

`GapConfiguration[dim_, lset_] :` a us
following format:

`{channel, gap, spin} : demand α
 Δ unitary[dim, l]`

`{channel, IndividualOperator[Δ 0], spi
{channel, IndividualOperator[Δ 0, ope
{channel, IntervalPositivity[Δ min, Δ m`

`AutoCB3$Condition` uses the "dim"

`GapConfiguration_List :` a list simila
numbers.

initialize simpleboot

```
In[14]:= AutoCB3$Init[crossvecobj, blockConfObj];
```

SDP template

```
In[15]:= ObjGet[crossvecobj, "VBlock"] [[All, 1]]
```

```
Out[15]= {op[op, S, 1, 1], op[op, T, 1, 1], op[op, A, 1, -1]}
```

```
GapConfiguration[dim_, lset_] := {
  {op[op, "S", 1, 1], Delta$s, {0}},
  {op[op, "S", 1, 1],  $\Delta$ unitary[dim, f], Select[lset, EvenQ[#] && # > 0 &]},
  {op[op, "T", 1, 1],  $\Delta$ unitary[dim, f], Select[lset, EvenQ[#] && # >= 0 &]}
};
```

```
mySDPTemplate[] := Module[
  {objective, normalization, conditions},
  objective = AutoCB3$Vector[CrossVec["zero"]];
  normalization = AutoCB3$Vector[CrossVec["identity"]];
```



PI_Symmetry (n...



Tutorial3B_note...



config.m - Wolf...



testrun.nb - Wo...



simpleboot_ma...



10:03 PM



ENG

Wednesday



4/26/2023



simpleboot_tutori...



Bootstrapping Hei...



testrun

`AutoCB3$Condition[prefactor, cross
gap, spinset.`

Example : `AutoCB3$Condition[Pre`

`AutoCB3$Condition[GapConfigurat
AutoCB3$Condition[GapConfigurat`

GapConfigurationFunc :

`GapConfiguration[dim_, lset_]` : a us
following format:

`{channel, gap, spin}` : demand α
 `Δ unitary[dim, l]`

`{channel, IndividualOperator[Δ 0], spi`
`{channel, IndividualOperator[Δ 0, ope`
`{channel, IntervalPositivity[Δ min, Δ m`

`AutoCB3$Condition` uses the "dim"

`GapConfiguration_List` : a list simila
numbers.

initialize simpleboot

```
In[14]:= AutoCB3$Init[crossvecobj, blockConfObj];
```

SDP template

```
In[15]:= ObjGet[crossvecobj, "VBlock"] [[All, 1]]
```

```
Out[15]= {op[op, S, 1, 1], op[op, T, 1, 1], op[op, A, 1, -1]}
```

```
GapConfiguration[dim_, lset_] := {
  {op[op, "S", 1, 1], Delta$s, {0}},
  {op[op, "S", 1, 1],  $\Delta$ unitary[dim, f], Select[lset, EvenQ[#] && # > 0 &]},
  {op[op, "T", 1, 1],  $\Delta$ unitary[dim, f], Select[lset, EvenQ[#] && # ≥ 0 &]},
  {op[op, "A", 1, 1],  $\Delta$ unitary[dim, f], Select[lset, EvenQ[#] && # ≥ 0 &]}
};
```

```
mySDPTemplate[] := Module[
  {objective, normalization, conditions},
  objective = AutoCB3$Vector[CrossVec["zero"]];
  normalization = AutoCB3$Vector[CrossVec["identity"]];
```

```
{channel, individualOperator[Δ0, opelist, spin]} // demand α · (ope.Fchannel, Δ0, spin.ope) ≤ 0
{channel, IntervalPositivity[Δmin, Δm
```

```
};
```

AutoCB3\$Condition uses the "dim"

GapConfiguration_List : a list similar numbers.

SDP template

SDP template is a user defined data

SDPData[objective, normalization, conditions]
 objective, normalization : produced
 conditions : produced by AutoCB3\$

Function : AutoCB3\$SaveSDP

AutoCB3\$SaveSDPTemplate
 AutoCB3\$SaveSDPTemplate[template]
 AutoCB3\$SaveSDPTemplate[template]

Function : AutoCB3\$Genera

```
In[25]:= mySDPTemplate[] := Module[
  {objective, normalization, conditions},
  objective = AutoCB3$Vector[CrossVec["zero"]];
  normalization = AutoCB3$Vector[CrossVec["identity"]];

  conditions = AutoCB3$Condition[GapConfiguration];

  SDPData[objective, normalization, conditions]
];
```

```
In[26]:= AutoCB3$SaveSDPTemplate@mySDPTemplate[]
AutoCB3$SDPConsistencyCheck warning: find unresolved symbols. user should
make sure those symbols are user-defined variables : {Delta$, ngroup}
```

```
Out[26]= ./Proj_Tutorial3B_testrun/Proj_Tutorial3B_testrun_SDPTemplate.m
```

AutoCB3\$Condition :

This function generate template expression of “positive matrix with prefactor” based given bootstrap conditions

`AutoCB3$Condition[prefactor,crossvec,gap,spinset]` : produce a list of “positive matrix with prefactor” corresponding to `prefactor`, `crossvec`, `gap`, `spinset`.

Example : `AutoCB3$Condition[PrefactorDR[op[op, “E”, 1, 1],0,3], CrossVec[op[op, “E”, 1, 1]],3,{0}]`

`AutoCB3$Condition[GapConfigurationFunc]` : produce a list of “positive matrix with prefactor” using `GapConfigurationFunc`

`AutoCB3$Condition[GapConfiguration_List]` : produce a list of “positive matrix with prefactor” using `GapConfigurationFunc`

GapConfigurationFunc :

`GapConfiguration[dim_,lset_]` : a user defined function. Return a list of item represents bootstrap condition. The element is in one of the following format:

`{channel,gap,spin}` : demand $\alpha \cdot F_{\text{channel}} \geq 0$ for $\Delta > \text{gap}$ and L in spins. spins can be a integer or set of integers. gap can be `$\Delta_{\text{unitary}}[\text{dim},/]$`

`{channel,IndividualOperator[$\Delta 0$,spin]}` // demand $\alpha \cdot (F_{\text{channel},\Delta 0,\text{spin}}) \geq 0$

`{channel,IndividualOperator[$\Delta 0$,ope_List,spin]}` // demand $\alpha \cdot (\text{ope} \cdot F_{\text{channel},\Delta 0,\text{spin}} \cdot \text{ope}) \geq 0$

`{channel,IntervalPositivity[Δ_{min} , Δ_{max}],spin}` // demand $\alpha \cdot F_{\text{channel},\Delta,\text{spin}} \geq 0$ for $\Delta_{\text{min}} < \Delta < \Delta_{\text{max}}$

`AutoCB3$Condition` uses the “dim” and “lset” in `blockConfObj` to call this function

`GapConfiguration_List` : a list similar to `GapConfigurationFunc`, but each element corresponds to a single spin channel and gaps are explicit



`CrossVec[channel, Δval, opelist, /val]` testrun.nb * - Wolfram Mathematica 11.1

Examples :

`AutoCB3$Vector [CrossVec ["identi`
`AutoCB3$Vector [CrossVec ["zero"]`

```
conditions=AutoCB3$Condition[GapConfiguration];
SDPData[objective,normalization,conditions]
];
```

Function : AutoCB3\$Condi

AutoCB3\$Condition :

This function generate template exp

`AutoCB3$Condition[prefactor, cross`
`gap, spinset.`

Example : `AutoCB3$Condition[Pre`

`AutoCB3$Condition[GapConfigurat`
`AutoCB3$Condition[GapConfigurat`

GapConfigurationFunc :

`GapConfiguration[dim_, lset_] :` a us
following format:

`{channel, gap, spin}` : demand α

Generate a SDP

- SDP\$
- SDP\$filename
- SDP\$filename2
- SDP\$prec
- SDP\$ref
- SDP\$ref\$filename

`CrossVec[channel, Δval, opelist, /val]`

Examples :

`AutoCB3$Vector [CrossVec ["identi`
`AutoCB3$Vector [CrossVec ["zero"]`

Function : AutoCB3\$Condi

AutoCB3\$Condition :
This function generate template exp

`AutoCB3$Condition[prefactor, cross`
`gap, spinset.`
Example : `AutoCB3$Condition[Pre`

`AutoCB3$Condition[GapConfigurat`
`AutoCB3$Condition[GapConfigurat`

GapConfigurationFunc :
`GapConfiguration[dim_, lset_] :` a us
following format:
{channel, gap, spin} : demand α

```
conditions=AutoCB3$Condition[GapConfiguration];  
SDPData[objective,normalization,conditions]  
];
```

Generate a SDP

```
SDP$ON$V[point_, filename_ : Automatic] := Module [  
  {Δv, Δs},  
  ^];
```

numbers.

SDP template

SDP template is a user defined data with the format:

SDPData[objective,normalization,conditions]
objective,normalization : produced by AutoCB3\$Vector
conditions : produced by AutoCB3\$Condition

Function : AutoCB3\$SaveSDPTemplate

AutoCB3\$SaveSDPTemplate

AutoCB3\$SaveSDPTemplate[templateSDP] : save a SDP template as default SDP template for the project
AutoCB3\$SaveSDPTemplate[templateSDP, filename] : save a SDP template to filename

Function : AutoCB3\$GenerateSDP

Scanner

Project file and data

Variable : SB\$Proi. SB\$Proi\$FileName

Windows taskbar showing various open applications: simpleboot_tutori..., Bootstrapping Hei..., Proj_Tutorial3B_te..., PI_Symmetry (n..., Tutorial3B_note..., config.m - Wolf..., testrun.nb - Wo..., simpleboot_ma... The system tray on the right shows the time 10:12 PM, date Wednesday 4/26/2023, and language ENG. A zoom level of 125% is indicated at the bottom right.

Bootstrap equations

Crossing equations :

$$\sum_{S^+} \lambda_0^2 V_{S,\Delta,l} + \sum_{T^+} \lambda_0^2 V_{T,\Delta,l} + \sum_{A^-} \lambda_0^2$$

$$V_{S,\Delta,l} = \begin{pmatrix} 0 \\ F_{\Delta,l}^- \\ F_{\Delta,l}^+ \end{pmatrix}, V_{T,\Delta,l} = \begin{pmatrix} F_{\Delta,l}^- \\ (1 - \frac{2}{N}) F_{\Delta,l}^- \\ -(1 + \frac{2}{N}) F_{\Delta,l}^+ \end{pmatrix}$$

Note : In simpleboot, the default def is in row 5. Therefore there is a (-1

Bound Δ_s v.s. Δ_ϕ

Scan the range $\Delta_\phi \in (0.510, 0.53)$,

Bound Δ_s v.s. Δ_ϕ with strong

Assume $\Delta_s \geq 3$, $\Delta_{\phi'} \geq 3.5$. Scan the

set up $O(2)$ vector, singlet mi

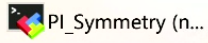
```
conditions=AutoCB3$Condition[GapConfiguration];
```

```
SDPData[objective,normalization,conditions]
];
```

Generate a SDP

```
SDP$ON$V[point_,filename_:Automatic]:=Module[
{Δv,Δs},
{Δv,Δs}=point//SetPrec$Real;

AutoCB3$GenerateSDP[{Δv},{“Delta$s”→Δs,“ngroup”→3},filename]
];
```



simpleboot_tutori...

Bootstrapping Hei...

Proj_Tutorial3B_te...

10:15 PM

ENG Wednesday

4/26/2023

System load: 0.37 Users logged in: 16

Usage of /: 41.7% of 99.94GB IP address for eno1np0: 10.10.21.98

Memory usage: 38% IP address for eno3: 172.16.2.250

Swap usage: 23% IP address for ib0: 192.168.2.250

Processes: 1199 IP address for docker0: 172.17.0.1

=> There is 1 zombie process.

* Introducing Expanded Security Maintenance for Applications.

Receive updates to over 25,000 software packages with your

Ubuntu Pro subscription! Free for personal use.

https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

16 updates can be applied immediately.

16 of these updates are standard security updates.

To see these additional updates run: apt list --upgradable

66 additional security updates can be applied with ESM Apps.

Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Your Hardware Enablement Stack (HWE) is supported until April 2023.

Last login: Tue Apr 25 23:02:23 2023 from 10.40.1.209

nsu2@mn003:~\$ scancel 410397

nsu2@mn003:~\$ scancel 410398

nsu2@mn003:~\$ cd /gpfs/nsu2/PI/Tutorial3B/

nsu2@mn003:~/gpfs/nsu2/PI/Tutorial3B\$

Quick connect...

/gpfs/nsu2/PITutorial3B/simpleboot/Packages/

Name	Size (KB)	Last
..		
AutoCB3.nb	314	2023-
BootstrapHelper.nb	241	2023-
Skydiving_v3.2.nb	126	2023-
ZhukovskyCoordinate.nb	186	2023-
ThetaSamplerDeltaMethod.nb	64	2023-
ClusterManager.m	13	2023-
ThetaSampler.nb	438	2023-
MoreThuente.nb	389	2023-
BisectionSampler.m	3	2023-
ThetaSamplerDeltaMethod.m	12	2023-
RemoteSDPB.nb	76	2023-
GenericScalarBlock.nb	446	2023-
Skydiving_v3.2.m	22	2023-
DeLaunaySampler.nb	164	2023-
Installer.m	3	2023-
SpecialUtilities.m	10	2023-
MoreThuente.m	10	2023-
SDPBAnalyzer.nb	95	2023-
MPSolve.nb	18	2023-
Bootstrapper.nb	15	2023-
SDPB.m	13	2023-
ThetaSampler.m	78	2023-
GenericScalarBlock.m	37	2023-
lockfswap.m	3	2023-
AutoCB.nb	61	2023-
SystemShell.nb	35	2023-

Follow terminal folder

```

      • MobaXterm 10.4 •
      (SSH client, X-server and networking tools)

  > SSH session to nsu2@10.10.21.98
    • SSH compression : ✓
    • SSH-browser      : ✓
    • X11-forwarding   : ✓ (remote display is forwarded through SSH)
    • DISPLAY          : ✓ (automatically set on remote server)

  > For more info, ctrl+click on help or visit our website

Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0-151-generic x86_64)

* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:        https://ubuntu.com/advantage

System information as of Wed Apr 26 16:17:11 EDT 2023

Last login: Wed Apr 26 13:28:45 2023 from 10.10.62.157
nsu2@mn003:~$ cd /gpfs/nsu2/PITutorial3B/
nsu2@mn003:/gpfs/nsu2/PITutorial3B$ git clone https://gitlab.com/bootstrapcollaboration/simpleboot.git
Cloning into 'simpleboot'...
remote: Enumerating objects: 360, done.
remote: Counting objects: 100% (260/260), done.
remote: Compressing objects: 100% (162/162), done.
remote: Total 360 (delta 126), reused 205 (delta 87), pack-reused 100
Receiving objects: 100% (360/360), 2.19 MiB | 11.66 MiB/s, done.
Resolving deltas: 100% (154/154), done.
nsu2@mn003:/gpfs/nsu2/PITutorial3B$

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <http://mobaxterm.mobatek.net>

config.m - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

Functions Sections Update

Debug Run All Code

```
Cluster$Configuration = {
  "Cluster.LoginServer" -> "10.10.21.98", (* The address of your cluster *)
  "Cluster.Account" -> "nsu2", (* Your account. Simpleboot will use "ssh |Cluster.Account|@|Cluster.LoginServer|" to connect to
  "Cluster.WorkspaceDirectory" -> "/gpfs/nsu2/PITutorial3B/workspace", (* Workspace directory on the cluster *)
  "Cluster.PackageDirectory" -> "/gpfs/nsu2/PITutorial3B/simpleboot/Packages", (* Packages directory on the cluster *)

  "Local.PackageDirectory" -> "C:\\Users\\shinn\\OneDrive\\talks\\Perimeter_minicourse\\slides\\Tutorial3B_fresh\\simpleboot\\Pack
  (* simpleboot package directory for the current workspace. If this is on your laptop, it should be the simpleboot package director;
  If you prefer to use dropbox/OneDrive to host the file and use multiple computers to work on the project, you may set an environme

  "AutoCB3.scalar blocks mod.script" ->
  False, (* The script to call scalar blocks mod *)
  "AutoCB3.sdp2input mod.script" ->
  False, (* The script to call sdp2input mod *)
  "AutoCB3.sdpdd" ->
  False, (* The script to call sdpdd *)
  "sdpb.script" ->
  False, (* The script to call SDPB *)
  "DynamicSDPB.script" ->
  False, (* The script to call skydiving *)
```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <http://mobaxterm.mobatek.net>

Name	Size (KB)	Last m
..		
simpleboot		2023-04-

```

> SSH session to nsu2@10.10.21.98
  • SSH compression : ✓
  • SSH-browser      : ✓
  • X11-forwarding  : ✓ (remote display is forwarded through SSH)
  • DISPLAY         : ✓ (automatically set on remote server)

> For more info, ctrl+click on help or visit our website

Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0-151-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Wed Apr 26 16:17:11 EDT 2023

Last login: Wed Apr 26 13:28:45 2023 from 10.10.62.157
nsu2@mn003:~$ cd /gpfs/nsu2/PITutorial3B/
nsu2@mn003:/gpfs/nsu2/PITutorial3B$ git clone https://gitlab.com/bootstrapcollaboration/simpleboot.git
Cloning into 'simpleboot'...
remote: Enumerating objects: 360, done.
remote: Counting objects: 100% (260/260), done.
remote: Compressing objects: 100% (162/162), done.
remote: Total 360 (delta 126), reused 205 (delta 87), pack-reused 100
Receiving objects: 100% (360/360), 2.19 MiB | 11.66 MiB/s, done.
Resolving deltas: 100% (154/154), done.
nsu2@mn003:/gpfs/nsu2/PITutorial3B$ export phys_cores_per_node=$(lscpu | awk '/^Core.s. per socket:/ {cores=$NF}
/^Socket.s.:/ {sockets=$NF} END {print cores * sockets}')
nsu2@mn003:/gpfs/nsu2/PITutorial3B$ echo $phys_cores_per_node
24
nsu2@mn003:/gpfs/nsu2/PITutorial3B$

```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <http://mobaxterm.mobatek.net>

Name	Size (KB)	Last m
..		
workspace		2023-04-
simpleboot		
workspace	2023-04-26 22:21	nsu2 users drwxr-xr-x

```

> SSH session to nsu2@10.10.21.98
  • SSH compression : ✓
  • SSH-browser      : ✓
  • X11-forwarding  : ✓ (remote display is forwarded through SSH)
  • DISPLAY         : ✓ (automatically set on remote server)
  
```

```

Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.15.0-151-generic x86_64)

* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:       https://ubuntu.com/advantage

System information as of Wed Apr 26 16:17:11 EDT 2023

Last login: Wed Apr 26 13:28:45 2023 from 10.10.62.157
nsu2@mn003:~$ cd /gpfs/nsu2/PITutorial3B/
nsu2@mn003:/gpfs/nsu2/PITutorial3B$ git clone https://gitlab.com/bootstrapcollaboration/simpleboot.git
Cloning into 'simpleboot'...
remote: Enumerating objects: 360, done.
remote: Counting objects: 100% (260/260), done.
remote: Compressing objects: 100% (162/162), done.
remote: Total 360 (delta 126), reused 205 (delta 87), pack-reused 100
Receiving objects: 100% (360/360), 2.19 MiB | 11.66 MiB/s, done.
Resolving deltas: 100% (154/154), done.
nsu2@mn003:/gpfs/nsu2/PITutorial3B$ export phys_cores_per_node=$(lscpu | awk '/^Core.s. per socket:/ {cores=$NF}
/^Socket.s.:/ {sockets=$NF} END {print cores * sockets}')
nsu2@mn003:/gpfs/nsu2/PITutorial3B$ echo $phys_cores_per_node
24
nsu2@mn003:/gpfs/nsu2/PITutorial3B$
  
```

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <http://mobaxterm.mobatek.net>

```
In[14]:= SDP$ON$V[point_,filename_:Automatic]:=Module[  
  {Δv,Δs},  
  {Δv,Δs}=point//SetPrec$Real;  
  
  AutoCB3$GenerateSDP[{Δv},{"Delta$s"→Δs,"ngroup"→3},filename]  
];
```

check cluster

```
In[16]:= Simpleboot$Installer$Workspace[]  
Bootstrapper Workspace will be installed to location : /gpfs/nsu2/PITutorial3B/workspace  
ClusterLoginNode$Evaluate[  
  R]  
]
```

Windows taskbar showing active applications: config.sh - 记事本, PI_Symmetry (ns...), Tutorial3B_note..., testrun.nb * - Wo..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., Scripts. System tray includes network, volume, and language (ENG) indicators. Date and time: Wednesday 4/26/2023, 10:22 PM.


```

In[16]:= Simpleboot$Installer$Workspace[]
          Bootstrapper Workspace will be installed to location : /gpfs/nsu2/PITutorial3B/workspace

In[18]:= SSH$UploadCurrentNotebook[]

Out[18]=

In[19]:= ClusterLoginNode$Evaluate[
          Print["123"]
          ]

Out[19]= Wed Apr 26 16:23:23 EDT 2023
          CPU Information:
            48 Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz
          /gpfs/nsu2/PITutorial3B/workspace
          Project director:
          Proj_Tutorial3B_testrun
          running MMA file:
          /gpfs/nsu2/PITutorial3B/simpleboot/Packages/boot.m
          with parameter:
          eyJ0ZXN0cnVuLm0iLCBib2xkW1ByaW50WyIxMjM1XV19 evaluate
          SSH$Evaluate: filename=testrun.m, expr=Hold[Print[123]]. Start evaluating...
          Bootstapper packages Loaded. Version : 4.0
          MMA Precision set to 200.
          123
          [RemoteExecuteReturnBegin] TnVsbA== [RemoteExecuteReturnEnd]
    
```

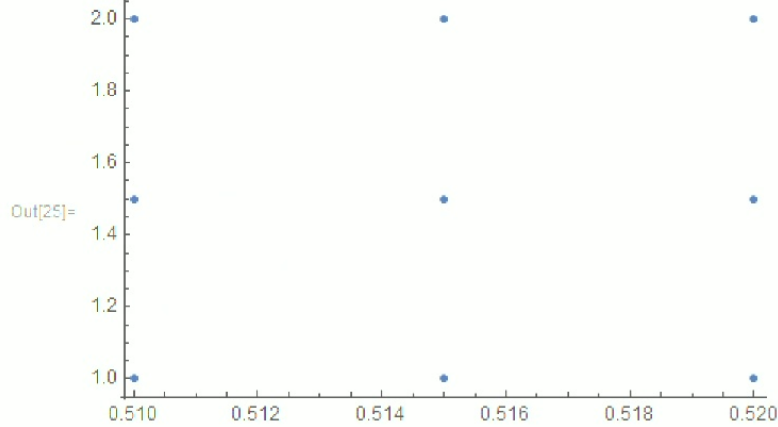
Windows taskbar showing open applications: config.sh - 记事本, PI_Symmetry (ns..., Tutorial3B_note..., testrun.nb - Wolf..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., testrun. System tray includes network, volume, and language (ENG) settings. Date and time: Wednesday 4/26/2023, 10:24 PM.

Generate a SDP

```
In[14]:= SDP$ON$V[point_,filename_:Automatic]:=Module[  
  {Δv,Δs},  
  {Δv,Δs}=point//SetPrec$Real;  
  
  AutoCB3$GenerateSDP[{Δv},{"Delta$s"→Δs,"ngroup"→3},filename]  
];
```

call |

Windows taskbar showing active applications: config.sh - 记事本, PI_Symmetry (ns..., Tutorial3B_note..., testrun.nb * - Wo..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., testrun. System tray includes network, volume, and system clock (10:25 PM, Wednesday 4/26/2023).



```
initpts = GeneratePointsInRectangular[{0.51, 0.52}, {1, 2}, 3, 3];
```

```
SB$FeasibilityScanner[
  SDP$ON$V, (* function that generates a SDP *)
  initpts, (* initial points to scan *)
  "--maxIterations=1000 --dualityGapThreshold=1e-25 --primalErrorThreshold=1e-15 --dualErrorThreshold=1e-15
  --precision=765 --initialMatrixScalePrimal=1e+20 --initialMatrixScaleDual=1e+20 --maxComplementarity=1e+70
  --detectPrimalFeasibleJump --detectDualFeasibleJump ", (* SDPB parameters *)

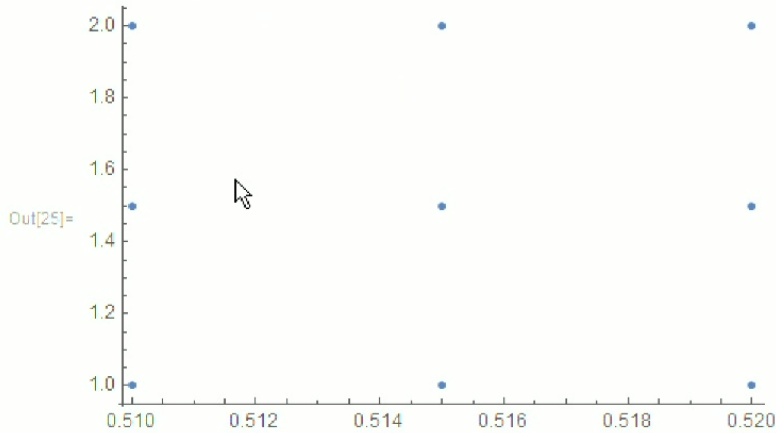
  {"Delaunay"}, (* scan method *)
  200, (* maximal points to scan *)
  False (* initial checkpoint. False means no initial checkpoint. *)
]
```

```
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
AutoCB3$GenerateSDP[{Δv}, {"Delta$s"→Δs, "ngroup"→3}, filename]
];
```

call the scanner

```
In[24]:= initpts = GeneratePointsInRectangular[{0.51, 0.52}, {1, 2}, 3, 3];
ListPlot[initpts]
```

... N: Requested precision 16 is smaller than \$MinPrecision. Using \$MinPrecision instead.



```
ClusterAsyn$Evaluate[
initpts = GeneratePointsInRectangular[{0.51, 0.52}, {1, 2}, 3, 3];
SB$FeasibilityScanner[
```

Windows taskbar showing various open applications: config.sh - 记事本, PI_Symmetry (ns...), Tutorial3B_note..., testrun.nb - Wolf..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., testrun, MobaTextEditor. System tray includes network, volume, and language (ENG) indicators. Date and time: Wednesday 4/26/2023 10:29 PM.

```
ClusterAsyn$Evaluate[
  AutoCB3$SaveSDPTemplate@mySDPTemplate[];
  initpts = GeneratePointsInRectangular[{0.51, 0.52}, {1, 2}, 3, 3];
  SB$FeasibilityScanner[
    SDP$ON$V, (* function that generates a SDP *)
    initpts, (* initial points to scan *)
    "--maxIterations=1000 --dualityGapThreshold=1e-25 --primalErrorThreshold=1e-15 --dualErrorThreshold=1e-15
    --precision=765 --initialMatrixScalePrimal=1e+20 --initialMatrixScaleDual=1e+20 --maxComplementarity=1e+70
    --detectPrimalFeasibleJump --detectDualFeasibleJump ", (* SDPB parameters *)

    {"None"}, (* scan method *)
    200, (* maximal points to scan *)
    False (* initial checkpoint. False means no initial checkpoint. *)
  ]
]
```

Out[28]= 410463

```
ClusterLoginNode$Evaluate@DeleteDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]", DeleteContents → True]
```

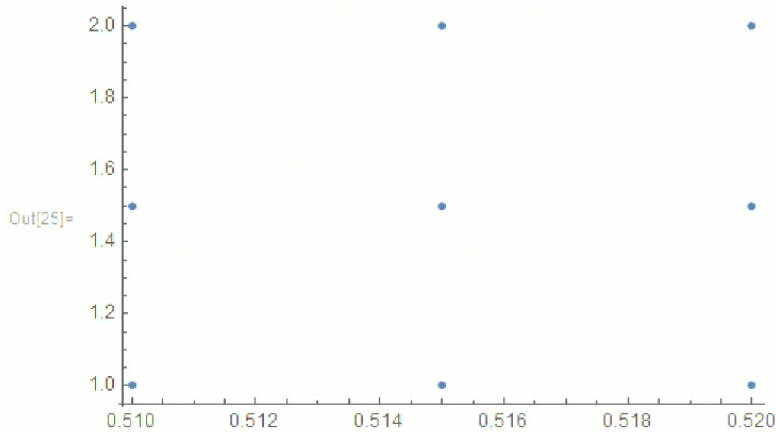
In[28]= ClusterAsyn\$JobOutput["410463"]

```
AutoCB3$GenerateSDP[{Δv}, {"Delta$s"→Δs, "ngroup"→3}, filename]
];
```

call the scanner

```
In[24]:= initpts = GeneratePointsInRectangular[{0.51, 0.52}, {1, 2}, 3, 3];
ListPlot[initpts]
```

... N: Requested precision 16 is smaller than \$MinPrecision. Using \$MinPrecision instead.



```
In[31]:= SSH$UploadCurrentNotebook [ ]
```

Out[31]=

Windows taskbar showing the following open applications: config.sh - 记事本, PI_Symmetry (ns...), Tutorial3B_note..., testrun.nb - Wolf..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., testrun, and MobaTextEditor. System tray on the right shows network, volume, and language (ENG) icons. The system clock displays 10:33 PM, Wednesday, 4/26/2023.

Out[37]=

```

In[38]:= ClusterAsyn$Evaluate [
  AutoCB3$SaveSDPTemplate@mySDPTemplate [ ];
  initpts = GeneratePointsInRectangular [ {0.51, 0.52}, {1, 2}, 3, 3];
  SB$FeasibilityScanner [
    SDP$ON$V, (* function that generates a SDP *)
    initpts, (* initial points to scan *)
    "--maxIterations=1000 --dualityGapThreshold=1e-25 --primalErrorThreshold=1e-15 --dualErrorThreshold=1e-15
    --precision=765 --initialMatrixScalePrimal=1e+20 --initialMatrixScaleDual=1e+20 --maxComplementarity=1e+70
    --detectPrimalFeasibleJump --detectDualFeasibleJump ", (* SDPB parameters *)

    {"Delaunay"}, (* scan method *)
    200, (* maximal points to scan *)
    False (* initial checkpoint. False means no initial checkpoint. *)
  ]
]

```

Out[38]= 410470

```

In[39]:= ClusterLoginNode$Evaluate@DeleteDirectory [ReconfigCmd@ "[Cluster.ProjectDirectory]", DeleteContents → True]

```

Out[39]= Wed Apr 26 16:34:17 EDT 2023

CPU Information:

48 Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz

/mnt/nfs2/PTTutorial3B/workspace

120%

Windows taskbar showing the following open applications from left to right:

- config.sh - 记事本
- PI_Symmetry (ns...)
- Tutorial3B_note...
- testrun.nb - Wolf...
- simpleboot_man...
- config.m - Wolfra...
- simpleboot_tutori...
- Bootstrapping Hei...
- testrun
- MobaTextEditor

System tray on the right shows: 10:35 PM, ENG, Wednesday 4/26/2023, and system icons for network, volume, and power.

```

-6.2300804540868753648300536087932858735848520262698002509213113659047619390492662266360142946313766098680214644451681
06589575537203569369444429846340798275597176283530593421259845317003661125378073351014035998150947529924163787528355
7 × 1025, Dobj → 0, Runtime → 5, TotalLines → 46},
timing → {xml/m → 0., block → 0., block_G → 0., block_G_scalarblocks → 0., block_convolve → 0.,
block_save → 0., block_load → 0., conditions → 0., AutoCB3.block → 1.89359, AutoCB3.sdp → 2.93107}},
{DeltaList → {0.51, 1.49995}, TerminateReason → dual, LastCheckpoint → 0.510000000000_1.49995000000_3_Apr26_16h34m56s.sdp,
SDPBRReturn → {TerminateReason → dual, Pobj →
-1.4865154007210836696449015195541644974055276368966416096895767926897151789380121037423308017450910291859120190830621
24026844804072152836198183256685141125580707876812806008276656309790162170183695451962135025230060748458127035758521
4 × 108, Dobj → 0, Runtime → 5, TotalLines → 47},
timing → {xml/m → 0., block → 0., block_G → 0., block_G_scalarblocks → 0., block_convolve → 0.,
block_save → 0., block_load → 0., conditions → 0., AutoCB3.block → 0.000755, AutoCB3.sdp → 2.77997}},
{DeltaList → {0.51, 1.9999}, TerminateReason → dual, LastCheckpoint → 0.510000000000_1.99990000000_3_Apr26_16h35m06s.sdp,
SDPBRReturn → {TerminateReason → dual, Pobj →
-9.1282100093008000904130475457473650753711045256612096311533296853084603337972067522659123664596557052423891643147418
20881296379677261316743760487712727927347400995679619375139155955982793039172279805686297841681941960735760479936890
106, Dobj → 0, Runtime → 0, TotalLines → 5}, timing → {xml/m → 0., block → 0., block_G → 0., block_G_scalarblocks → 0.,
block_convolve → 0., block_save → 0., block_load → 0., conditions → 0., AutoCB3.block → 0.000785, AutoCB3.sdp → 2.80999}},
{DeltaList → {0.515, 1.}, TerminateReason → primal, LastCheckpoint → 0.514999500000_1.00000000000_3_Apr26_16h35m14s.sdp,
SDPBRReturn → {TerminateReason → primal, Pobj →
-7.8617246987145440015348820249449436402515590391037626436122900024653191701602862458673613661155174288920466423106534

```

Windows taskbar showing various open applications: config.sh - 记事本, PL_Symmetry (ns...), Tutorial3B_note..., testrun.nb * - Wo..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., Proj_Tutorial3B_te..., MobaTextEditor. System tray includes volume, network, and system clock (10:37 PM, Wednesday, 4/26/2023).

```
--detectPrimalFeasibleJump --detectDualFeasibleJump ", (* SDPB parameters *)
```

```
{ "Delaunay"}, (* scan method *)
200, (* maximal points to scan *)
False (* initial checkpoint. False means no initial checkpoint. *)
]
]
```

Out[41]= 410471

In[36]= ClusterLoginNode\$Evaluate@DeleteDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]", DeleteContents -> True]

Out[36]= Wed Apr 26 16:34:17 EDT 2023

CPU Information:

48 Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz

/gpfs/nsu2/PITutorial3B/workspace

Project director:

Proj_Tutorial3B_testrun

running MMA file:

/gpfs/nsu2/PITutorial3B/simpleboot/Packages/boot.m

with parameter:

eyJ0ZXN0cnVuLm0iLCBib2xkW0R1bGV0ZURpcmVjdG9yeVtSZWNvbWZpZ0NtZFRsiW0sdXN0ZXIuUHJvamVjdERpcmVjdG9yeV0iXSwgRGVsZXRIQ29udGVudHM6
gLT4gVHJ1ZV1dfQ== evaluate

SSH\$Evaluate: filename=testrun.m,

expr=Hold[DeleteDirectory[ReconfigCmd[[Cluster.ProjectDirectory]], DeleteContents -> True]]. Start evaluating...

Destination package loaded. Version: 4.0

120%

Windows taskbar showing open applications: config.sh - 记事本, PL_Symmetry (ns...), Tutorial3B_note..., testrun.nb - Wolf..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., Proj_Tutorial3B_te..., MobaTextEditor. System tray includes network, volume, and language (ENG) indicators. Date and time: Wednesday 4/26/2023 10:38 PM.



In[50]:= SB\$Proj

```
Out[50]= {scheduled -> {}, calculating -> {{{0.510123, 1.25306}, 410471}, {{0.514074, 1.50612}, 410470}},
errorpoints -> {}, suspended -> {}, max_points -> 168, StopFlag -> False, method -> {sampler -> Delaunay},
DelaunayScaling -> {100.01, 1.0001}, ThetaBounds -> {}, InitTheta -> {}, SDPGenerator$main -> SDP$ON$V,
SDPGenerator$theta -> False, SDPBopt -> --maxIterations=1000 --dualityGapThreshold=1e-25
--primalErrorThreshold=1e-15 --dualErrorThreshold=1e-15 --precision=765 --initialMatrixScalePrimal=1e+20
--initialMatrixScaleDual=1e+20 --maxComplementarity=1e+70 --detectPrimalFeasibleJump --detectDualFeasibleJump ,
pvm2sdp$prec -> 1024, bEFMReport -> False, OPEscanQ -> False, InitCheckpoint -> False, ellipseBounds -> False,
calculated } {{DeltaList -> {0.51, 1.}, TerminateReason -> primal,
LastCheckpoint -> 0.510000000000_1.00000000000_3_Apr26_16h34m45s.sdp, SDPBReturn -> {TerminateReason -> primal, Pobj ->
-6.2300804540868753648300536087932858735848520262698002509213113659047619390492662266360142946313766098680214644451681:
06589575537203569369444429846340798275597176283530593421259845317003661125378073351014035998150947529924163787528355:
7 x 10^25, Dobj -> 0, Runtime -> 5, TotalLines -> 46},
timing -> {xml/m -> 0., block -> 0., block_G -> 0., block_G_scalarblocks -> 0., block_convolve -> 0.,
block_save -> 0., block_load -> 0., conditions -> 0., AutoCB3.block -> 1.89359, AutoCB3.sdp -> 2.93107}},
{DeltaList -> {0.51, 1.49995}, TerminateReason -> dual, LastCheckpoint -> 0.510000000000_1.49995000000_3_Apr26_16h34m56s.sdp,
SDPBReturn -> {TerminateReason -> dual, Pobj ->
-1.4865154007210836696449015195541644974055276368966416096895767926897151789380121037423308017450910291859120190830621:
...
```


Quick connect...

/gpfs/nsu2/PI/Tutorial3B/workspace/

Name	Size (KB)	Last m
..		
Proj_Tutorial3B_testrun		2023-04-
Scripts		2023-04-
test.txt	1	2023-04-
testrun.m	4	2023-04-

```

longq      up 7-00:00:00    16  alloc  cn[053-068]
amdq       up 1-00:00:00     1  drain* cn095
amdq       up 1-00:00:00    18  drain  cn[093-094,096-110],mn004
amdq       up 1-00:00:00    12  alloc  cn[079-090]
amddebugq  up 1:00:00             1  drain* cn095
amddebugq  up 1:00:00    18  drain  cn[093-094,096-110],mn004
amddebugq  up 1:00:00    12  alloc  cn[079-090]
amddebugq  up 1:00:00     2  idle   cn[091-092]
amdpreq    up 1-00:00:00     1  drain* cn095
amdpreq    up 1-00:00:00    18  drain  cn[093-094,096-110],mn004
amdpreq    up 1-00:00:00    12  alloc  cn[079-090]
amdpreq    up 1-00:00:00     2  idle   cn[091-092]
gpupreq    up 1-00:00:00     1  idle   cn077
gpupreq    up 1-00:00:00     1  down   cn078
actq       up infinite          0  n/a

nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B$ squeue -u nsu2
  JOBID PARTITION  NAME          USER ST        TIME  NODES NODELIST(REASON)
  410463 amddebugq RunMMA_j    nsu2 R           0:06     1 cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B$ cd /gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun/
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ squeue -u nsu2
  JOBID PARTITION  NAME          USER ST        TIME  NODES NODELIST(REASON)
  410463 amddebugq RunMMA_j    nsu2 R           1:09     1 cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410463
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ squeue -u nsu2
  JOBID PARTITION  NAME          USER ST        TIME  NODES NODELIST(REASON)
  410471 amddebugq RunMMA_j    nsu2 R           5:17     1 cn092
  410470 amddebugq RunMMA_j    nsu2 R           7:05     1 cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410471
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410470
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ cd /gpfs/nsu2/PI/Tutorial3B/workspace/
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace$

```

Follow terminal folder

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Windows taskbar showing open applications: config.sh - 记事本, PI_Symmetry (nsu2), Tutorial3B_note..., testrun.nb - Wolf..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., slides, MobaTextEditor. System tray shows time 10:42 PM, date Wednesday 4/26/2023, and language ENG.

Quick connect...

/gpfs/nsu2/PI/Tutorial3B/workspace/

Name	Size (KB)	Last m
..		
Proj_Tutorial3B_testrun		2023-04-
Scripts		2023-04-
test.txt	1	2023-04-
testrun.m	4	2023-04-

```

longq      up 7-00:00:00    16  alloc  cn[053-068]
amdq       up 1-00:00:00     1  drain* cn095
amdq       up 1-00:00:00    18  drain  cn[093-094,096-110],mn004
amdq       up 1-00:00:00    12  alloc  cn[079-090]
amddebugq  up      1:00:00         1  drain* cn095
amddebugq  up      1:00:00    18  drain  cn[093-094,096-110],mn004
amddebugq  up      1:00:00    12  alloc  cn[079-090]
amddebugq  up      1:00:00     2  idle   cn[091-092]
amdpreq    up 1-00:00:00     1  drain* cn095
amdpreq    up 1-00:00:00    18  drain  cn[093-094,096-110],mn004
amdpreq    up 1-00:00:00    12  alloc  cn[079-090]
amdpreq    up 1-00:00:00     2  idle   cn[091-092]
gpupreq    up 1-00:00:00     1  idle   cn077
gpupreq    up 1-00:00:00     1  down   cn078
actq       up infinite         0  n/a

nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B$ squeue -u nsu2
  JOBID PARTITION  NAME          USER ST        TIME  NODES NODELIST(REASON)
  410463 amddebugq  RunMMA_j     nsu2 R           0:06     1  cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B$ cd /gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun/
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ squeue -u nsu2
  JOBID PARTITION  NAME          USER ST        TIME  NODES NODELIST(REASON)
  410463 amddebugq  RunMMA_j     nsu2 R           1:09     1  cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410463
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ squeue -u nsu2
  JOBID PARTITION  NAME          USER ST        TIME  NODES NODELIST(REASON)
  410471 amddebugq  RunMMA_j     nsu2 R           5:17     1  cn092
  410470 amddebugq  RunMMA_j     nsu2 R           7:05     1  cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410471
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410470
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ cd /gpfs/nsu2/PI/Tutorial3B/workspace/
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace$

```

Follow terminal folder

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Windows taskbar showing open applications: config.sh - 记事本, PI_Symmetry (nsu2), Tutorial3B_note..., testrun.nb - Wolf..., simpleboot_man..., config.m - Wolfra..., simpleboot_tutori..., Bootstrapping Hei..., slides, MobaTextEditor. System tray shows date and time: 10:42 PM, Wednesday, 4/26/2023.

Tutorial3B_fresh

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文件 主页 共享 查看

固定到快速访问 复制 粘贴 剪切 复制路径 粘贴快捷方式 移动到 复制到 删除 重命名 新建项目 轻松访问 新建文件夹 属性 打开 历史记录 全部选择 全部取消 反向选择

剪贴板 组织 新建 打开 选择

← ↑ OneDrive - Personal > talks > Perimeter_minicourse > slides > Tutorial3B_fresh

名称	状态	修改日期	类型	大小
uniquenesstheorem				
已发送的文件				
您的团队's shared workspace				
simpleboot	🔄	4/26/2023 9:36 PM	文件夹	
start	🔄	4/26/2023 9:30 PM	文件夹	
testrun	🔄	4/26/2023 10:21 PM	文件夹	

OneDrive - Personal

- Desktop
- Documents
- Email attachments
- English
- job
- medical_docs
- Music
- painting
- paper
- Personal
- Pictures
- project_ga1ahad
- talks

3 个项目

config.sh - 记事本 | PI_Symmetry (ns...) | Tutorial3B_note... | testrun.nb - Wolf... | simpleboot_man... | config.m - Wolfra... | simpleboot_tutori... | Bootstrapping Hei... | Tutorial3B_fresh | MobaTextEditor

10:43 PM Wednesday 4/26/2023

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文件 主页 共享 查看

固定到快速访问 复制 粘贴 剪贴板 剪切 复制路径 粘贴快捷方式 移动到 复制到 删除 重命名 新建项目 轻松访问 新建文件夹 属性 打开 历史记录 全部选择 全部取消 反向选择

OneDrive - Personal > talks > Perimeter_minicourse > slides > Tutorial3B_fresh > testrun

名称	状态	修改日期	类型	大小
uniquenesstheorem				
已发送的文件				
您的团队's shared workspace				
autoboot	✓	4/26/2023 9:36 PM	文件夹	
Proj_Tutorial3B_testrun	✓	4/26/2023 10:36 PM	文件夹	
Scripts	✓	4/26/2023 9:36 PM	文件夹	
temp	✓	4/26/2023 9:36 PM	文件夹	
无标题 - 记事本			记事本	
RunMMA_job.sh	✓	4/24/2023 10:36 PM	文件(F) 编辑(E) 格式(O) 查看(V) 帮助(H)	
simpleboot_manual.nb	✓	4/26/2023 10:36 PM	文件	
testrun.m	✓	4/26/2023 9:36 PM	文件	
testrun.nb	✓	4/26/2023 9:36 PM	文件	
Tutorial3B_note.nb	✓	4/26/2023 9:36 PM	文件	

9个项目 选中 1个项目 445 字节 始终在此设备上可用

config.sh - 记... 无标题 - 记事本 PI_Symmetry ... Tutorial3B_n... testrun.nb - ... simpleboot_... config.m - Wolf... config.m - Wolf... simpleboot_tut... Bootstrapping ... testrun MobaTextEditor

10:45 PM Wednesday 4/26/2023

正在共享桌面 | 停止共享

文件 主页 共享 查看

固定到快速访问 复制 粘贴 剪切 复制路径 粘贴快捷方式 移动到 复制到 删除 重命名 新建项目 轻松访问 新建文件夹 属性 打开 历史记录 全部选择 全部取消 反向选择

OneDrive - Personal > talks > Perimeter_minicourse > slides > Tutorial3B_fresh > testrun

名称	状态	修改日期	类型	大小
uniquenesstheorem				
已发送的文件				
您的团队's shared workspace				
autoboot	✓	4/26/2023 9:36 PM	文件夹	
Proj_Tutorial3B_testrun	✓	4/26/2023 10:36 PM	文件夹	
Scripts	✓	4/26/2023 9:36 PM	文件夹	
temp	✓	4/26/2023 10:21 PM	文件夹	
run.sh	🔄	4/26/2023 10:46 PM	SH 文件	1 KB
simpleboot_manual.nb	✓	4/26/2023 3:43 PM	Wolfram Noteb...	78 KB
testrun.m	✓	4/26/2023 10:41 PM	Wolfram Mathe...	5 KB
testrun.nb	✓	4/26/2023 10:41 PM	Wolfram Noteb...	60 KB
Tutorial3B_note.nb	✓	4/26/2023 9:01 PM	Wolfram Noteb...	14 KB

9 个项目 选中 1 个项目 195 字节 同步被挂起

config.m - Wolfra... simpleboot_tutori... Bootstrapping Hei... testrun MobaTextEditor

10:47 PM Wednesday 4/26/2023

正在共享桌面 | 停止共享

文件 主页 共享 查看

固定到快速访问 复制 粘贴 剪切 复制路径 粘贴快捷方式 移动到 复制到 删除 重命名 新建项目 轻松访问 新建文件夹 属性 打开 历史记录 全部选择 全部取消 反向选择

剪贴板 组织 新建 打开 选择

← ↑ OneDrive - Personal > talks > Perimeter_minicourse > slides > Tutorial3B_fresh > testrun > 搜索"testrun"

名称	状态	修改日期	类型	大小
uniquenesstheorem				
已发送的文件				
您的团队's shared workspace				
autoboot	✓	4/26/2023 9:36 PM	文件夹	
Proj_Tutorial3B_testrun	✓	4/26/2023 10:36 PM	文件夹	
Scripts	✓	4/26/2023 9:36 PM	文件夹	
temp	✓	4/26/2023 10:21 PM	文件夹	
run.sh	🔄	4/26/2023 10:46 PM	SH 文件	1 KB
simpleboot_manual.nb	✓	4/26/2023 3:43 PM	Wolfram Noteb...	78 KB
testrun.m	✓	4/26/2023 10:41 PM	Wolfram Mathe...	5 KB
testrun.nb	✓	4/26/2023 10:41 PM	Wolfram Noteb...	60 KB
Tutorial3B_note.nb	✓	4/26/2023 9:01 PM	Wolfram Noteb...	14 KB

9 个项目 选中 1 个项目 195 字节 同步被挂起

config.m - Wolfra... simpleboot_tutori... Bootstrapping Hei... testrun MobaTextEditor

10:47 PM Wednesday 4/26/2023

3. PI_Symmetry (nsu2)

/gpfs/nsu2/PITutorial3B/workspace2/

Name	Size (KB)	Last m
Scripts		2023-04-
runMMA.m	1	2023-04-
run.sh	1	2023-04-
testrun.m	4	2023-04-

Follow terminal folder

```

JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
410463 amddebugq RunMMA_j nsu2 R 1:09 1 cn091
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410463
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ queue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ queue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
410471 amddebugq RunMMA_j nsu2 R 5:17 1 cn092
410470 amddebugq RunMMA_j nsu2 R 7:05 1 cn091
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410471
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410470
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ cd /gpfs/nsu2/PITutorial3B/workspace/
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace$ cd /gpfs/nsu2/PITutorial3B/workspace2/Scripts/
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rw-r--r-- 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rw-r--r-- 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rw-r--r-- 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rw-r--r-- 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ chmod +x *.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rwxr-xr-x 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rwxr-xr-x 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rwxr-xr-x 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rwxr-xr-x 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ cd ..
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ ls
runMMA.m run.sh Scripts testrun.m
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ chmod +x run.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$

```

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Quick connect...

Name	Size (KB)	Last m
SDPBFiles		2023-04-
BlockData		2023-04-
project_status.txt	2	2023-04-
Proj_Tutorial3B_testrun_SDPTem...	124	2023-04-

```

nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
410471 amddebugq RunMMA_j nsu2 R 5:17 1 cn092
410470 amddebugq RunMMA_j nsu2 R 7:05 1 cn091
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410471
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410470
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ cd /gpfs/nsu2/PITutorial3B/workspace/
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace$ cd /gpfs/nsu2/PITutorial3B/workspace2/Scripts/
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rw-r--r-- 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rw-r--r-- 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rw-r--r-- 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rw-r--r-- 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ chmod +x *.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rwxr-xr-x 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rwxr-xr-x 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rwxr-xr-x 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rwxr-xr-x 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ cd ..
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ ls
runMMA.m run.sh Scripts testrun.m
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ chmod +x run.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ sbatch run.sh runMMA.m
Submitted batch job 410473
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
410473 amddebugq run.sh nsu2 R 0:08 1 cn091
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$

```

gpfs/nsu2/PITutorial3B/workspace2/Proj_Tutorial3B_testrun/

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Quick connect...

/gpfs/nsu2/PI/Tutorial3B/workspace2/

Name	Size (KB)	Last m
..		
Proj_Tutorial3B_testrun		2023-04-
Scripts		2023-04-
test.txt	1	2023-04-
slurm-410473.out	9	2023-04-
runMMA.m	1	2023-04-
run.sh	1	2023-04-
testrun.m	4	2023-04-

Follow terminal folder

```

410471 amddebugq RunMMA_j nsu2 R 5:17 1 cn092
410470 amddebugq RunMMA_j nsu2 R 7:05 1 cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410471
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ scancel 410470
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace/Proj_Tutorial3B_testrun$ cd /gpfs/nsu2/PI/Tutorial3B/workspace/
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace$ cd /gpfs/nsu2/PI/Tutorial3B/workspace2/Scripts/
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rw-r--r-- 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rw-r--r-- 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rw-r--r-- 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rw-r--r-- 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2/Scripts$ chmod +x *.sh
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rwxr-xr-x 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rwxr-xr-x 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rwxr-xr-x 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rwxr-xr-x 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2/Scripts$ cd ..
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2$ ls
runMMA.m run.sh Scripts testrun.m
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2$ chmod +x run.sh
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2$ sbatch run.sh runMMA.m
Submitted batch job 410473
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
410473 amddebugq run.sh nsu2 R 0:08 1 cn091
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2$ scancel 410473
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2$ cd /gpfs/nsu2/PI/Tutorial3B/workspace2/
nsu2@mn003:/gpfs/nsu2/PI/Tutorial3B/workspace2$

```

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Quick connect...

3. PI_Symmetry (nsu2)

Name	Size (KB)	Last m
..		
Proj_Tutorial3B_testrun		2023-04-
Scripts		2023-04-
test.txt		2023-04-
testrun.m	1	2023-04-
slurm-410473.out	9	2023-04-
runMMA.m	1	2023-04-
run.sh	1	2023-04-
testrun.m	4	2023-04-

```

nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace/Proj_Tutorial3B_testrun$ cd /gpfs/nsu2/PITutorial3B/workspace/
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace$ cd /gpfs/nsu2/PITutorial3B/workspace2/Scripts/
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rw-r--r-- 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rw-r--r-- 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rw-r--r-- 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rw-r--r-- 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ chmod +x *.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ ls -l
total 0
-rw-r--r-- 1 nsu2 users 2740 Apr 26 16:44 config.m
-rwxr-xr-x 1 nsu2 users 1049 Apr 26 16:44 config.sh
-rwxr-xr-x 1 nsu2 users 445 Apr 26 16:44 RunMMA_job.sh
-rwxr-xr-x 1 nsu2 users 129 Apr 26 16:44 RunMMA_local.sh
-rwxr-xr-x 1 nsu2 users 265 Apr 26 16:44 RunMMA_submit.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2/Scripts$ cd ..
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ ls
runMMA.m run.sh Scripts testrun.m
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ chmod +x run.sh
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ sbatch run.sh runMMA.m
Submitted batch job 410473
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
410473 amddebugq run.sh nsu2 R 0:08 1 cn091
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ scancel 410473
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ cd /gpfs/nsu2/PITutorial3B/workspace/
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ run.sh runMMA.m
-bash: run.sh: command not found
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$ ls
Proj_Tutorial3B_testrun runMMA.m run.sh Scripts slurm-410473.out testrun.m test.txt
nsu2@mn003:/gpfs/nsu2/PITutorial3B/workspace2$

```

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