Title: Tutorial 1A: Introduction to simpleboot. 3D Ising Island with Delaunay search

Speakers: Ning Su

Collection: Mini-Course of Numerical Conformal Bootstrap

Date: April 24, 2023 - 1:30 PM

URL: https://pirsa.org/23040137

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```
"VBlock$Identity"→{Fp[sig,sig,sig,sig,0]
                   Fp[eps,eps,eps,eps,0]
                   0
                   Fp[sig,sig,eps,eps,0]
                   Hp[sig,sig,eps,eps,0]}, (* crossing vector for V_identity=(1 1)·V_even(Δ=0, ℓ=0)·{1,1} *)

"VBlock$Deriv"→{"odd"
                "odd"
                "odd"
                "odd"
                "even"}, (* indicate the 5 compenents are even/odd under u<->v exchange *)

"VBlock$External"→{"sig","eps"} (* the name of external operators as String *)
};
```

Block specifications

In[10]:=

```
(* conformal block specifications : spacetime dimension, derivative order, pole keeping order, r_ order, spins *)
blockconfobj={"dim"→3,"Λmax"→11,"κ"→12,"rN"→48,"lset"→Range[0,20]~Join~{49,52}};

dim = 3;
Lambda = 27;
AutoCB3$BlockSetting["DSD"][dim, Lambda] (* some presetting in simpleboot *)
```

```
{dim → 3, Λmax → 27, κ → 20, rN → 80, lset → {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,
   12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50}}
```

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```
"VBlock$External"→{"sig","eps"} (* the name of external operators as String *)
};
```

Block specifications

In[10]:=
```
(* conformal block specifications : spacetime dimension, derivative order, pole keeping order, r_ order, spins *)
blockconfobj={"dim"→3,"Λmax"→11,"κ"→12,"rN"→48,"lset"→Range[0,20]~Join~{49,52}};
```

In[30]:=
```
dim = 3;
Lambda = 19;
AutoCB3$BlockSetting["DSD"][dim, Lambda] (* some presetting in simpleboot *)
```

Out[32]=
```
{dim → 3, Λmax → 19, κ → 14, rN → 56,
 lset → {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 49, 50}}
```

Initialize simpleboot

In[11]:=
```
(* tell simpleboot about the crossing vectors and block specs *)
AutoCB3$Init[crossvecobj,blockconfobj];
```

AutoCB3$Init[crossvecobj,blockconfobj] : this function tells simpleboot about the crossing vectors and block specs.

Gaps

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AutoCB3$Init[crossvecobj,blockconfobj] : this function tells simpleboot about the crossing vectors and block specs.

Gaps

Format :

GapConfiguration is a List of element in one of the following format:
{channel,gap,spins} // this means demand $\alpha \cdot V_{\text{channel}} \geq 0$ for $\Delta >$ gap and L in spins. spins can be a integer or set of integers.
{channel,IndividualOperator[Δ0],spin} // this means demand $\alpha \cdot (V_{\text{channel},\Delta 0,\text{spin}}) \geq 0$
{channel,IndividualOperator[Δ0,ope_List],spin} // this means demand $\alpha \cdot (\text{ope}.V_{\text{channel},\Delta 0,\text{spin}}.\text{ope}) \geq 0$
{channel,IntervalPositivity[Δmin,Δmax],spin} // this means demand $\alpha \cdot V_{\text{channel},\Delta,\text{spin}} \geq 0$ for $\Delta\text{min} < \Delta < \Delta\text{max}$

In[12]:=
```
Clear@GapConfiguration;
GapConfiguration[dim_,lset_]:={
{op[op, "O", 1, 1],3,0}, (* α.V_odd>0 for Δ>3 and L=0 *)
{op[op, "E", 1, 1],3,0}, (* α.V_even>0 for Δ>3 and L=0 *)

{op[op, "E", 1, 1],Δunitary[dim, /],Select[lset, EvenQ[#] && # > 0 & ]},  (* α.V_even>0 for Δ>Δ_unitary and L=2, 4, ... *)
{op[op, "O", 1, -1],Δunitary[dim, /],Select[lset, OddQ ]},                (* α.V_odd>0 for Δ>Δ_unitary and L=1, 3, ... *)
{op[op, "O", 1, 1],Δunitary[dim, /],Select[lset, EvenQ[#] && # > 0 & ]}   (* α.V_odd>0 for Δ>Δ_unitary and L=2, 4, ... *)
};
```

/ : place holder for spin

SDP template

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Gaps

Format :

GapConfiguration is a List of element in one of the following format:

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{channel,IndividualOperator[Δ0],spin} // this means demand $\alpha \cdot (V_{\text{channel},\Delta 0,\text{spin}}) \geq 0$

{channel,IndividualOperator[Δ0,ope_List],spin} // this means demand $\alpha \cdot (\text{ope}.V_{\text{channel},\Delta 0,\text{spin}}.\text{ope}) \geq 0$

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In[12]:=

```
Clear@GapConfiguration;
GapConfiguration[dim_,lset_]:={
{op[op, "O", 1, 1],3,0}, (* α.V_odd>0 for Δ>3 and L=0 *)
{op[op, "E", 1, 1],3,0}, (* α.V_even>0 for Δ>3 and L=0 *)

{op[op, "E", 1, 1],Δunitary[dim, /],Select[lset, EvenQ[#] && # > 0 & ]},  (* α.V_even>0 for Δ>Δ_unitary and L=2, 4, ... *)
{op[op, "O", 1, -1],Δunitary[dim, /],Select[lset, OddQ ]},                (* α.V_odd>0 for Δ>Δ_unitary and L=1, 3, ... *)
{op[op, "O", 1, 1],Δunitary[dim, /],Select[lset, EvenQ[#] && # > 0 & ]}   (* α.V_odd>0 for Δ>Δ_unitary and L=2, 4, ... *)
};
```

/ : place holder for spin

SDP template

normalization:

$\alpha \cdot (V_{\text{identity}}) = 1$ with $V_{\text{identity}} = (1 \quad 1) \cdot V_{\text{even}}(\Delta = 0,\ / = 0) \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix}$

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$\alpha \cdot (V_{\text{identity}}) = 1$ with $V_{\text{identity}} = (1 \quad 1) \cdot V_{\text{even}}(\Delta = 0,\ l = 0) \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix}$

positivity condition:

$\alpha \cdot V_{\text{even}}(\Delta, l) \geq 0$ for $\Delta \geq 3,\ l = 0$

$\alpha \cdot V_{\text{odd}}(\Delta, l) \geq 0$ for $\Delta \geq 3,\ l = 0$

$\alpha \cdot V_{\text{even}}(\Delta, l) \geq 0$ for $\Delta \geq \Delta_{\text{unitary}},\ l = 2, 4, 6, \ldots$

$\alpha \cdot V_{\text{odd}}(\Delta, l) \geq 0$ for $\Delta \geq \Delta_{\text{unitary}},\ l = 1, 2, 3, 4, \ldots$

$\alpha . V_\theta \geq 0$ where $V_\theta = V_{\text{even}}(\Delta = \Delta_\epsilon, l = 0) + V_{\text{odd}}(\Delta = \Delta_\sigma, l = 0) \otimes \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$

In[14]:=

```
Clear@SDPTemplate$IsingOE;
SDPTemplate$IsingOE[]:=Module[
{BC$normalization,BC$objective,BC$condition,sdp,V$theta,
GFFnormalization},

BC$normalization=AutoCB3$Vector[CrossVec["identity"]];  (* α.V_identity=1 *)
BC$objective=AutoCB3$Vector[CrossVec["zero"]];
BC$condition=AutoCB3$Condition[1,CrossVec["V$theta"],0,{0}]~Join~  (* α.V_θ>0 *)
AutoCB3$Condition[GapConfiguration];  (* the rest positivity conditions *)

sdp=SDPData[BC$objective,BC$normalization,BC$condition];

sdp
];
```

~Join~ : see the note

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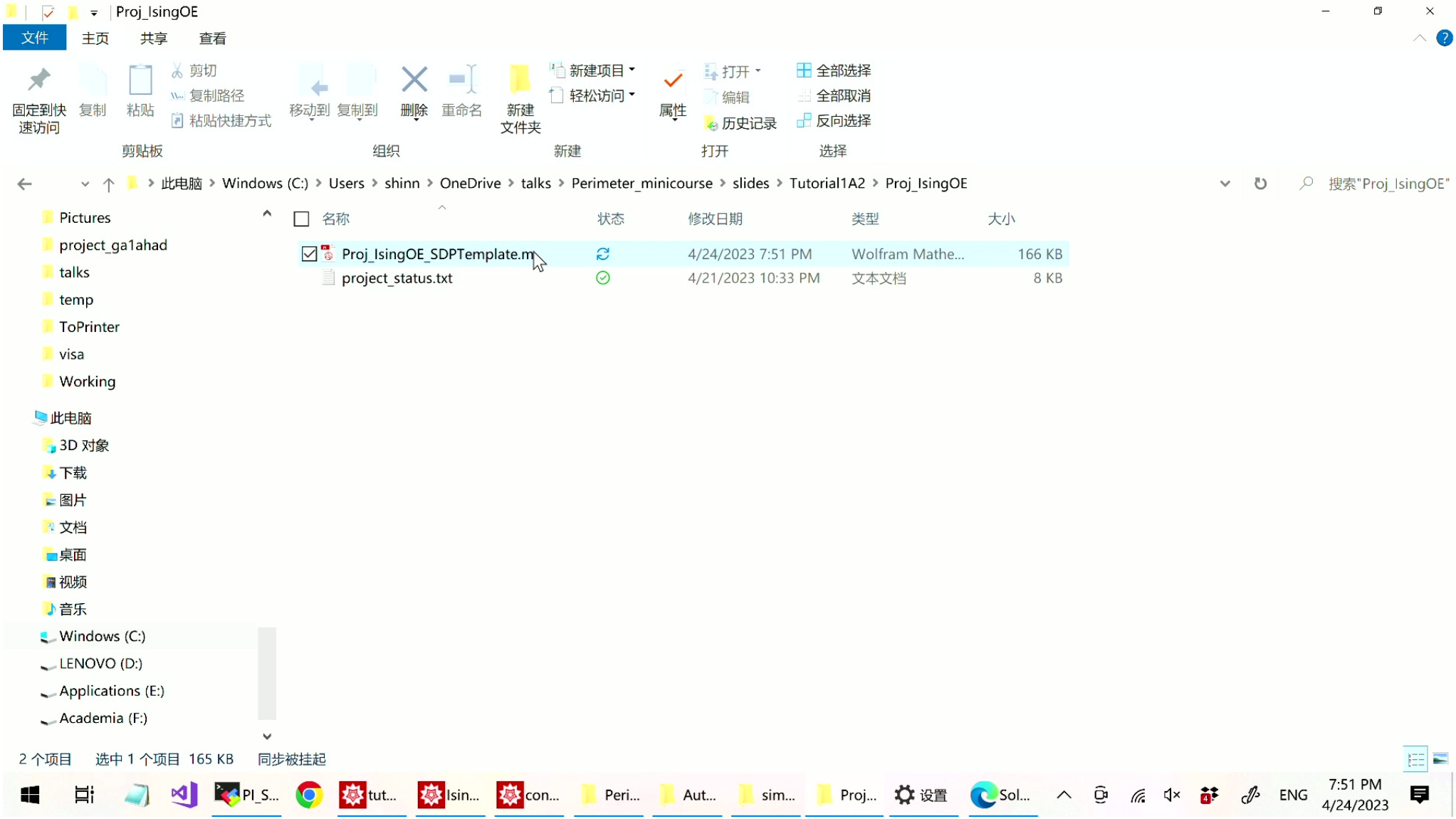
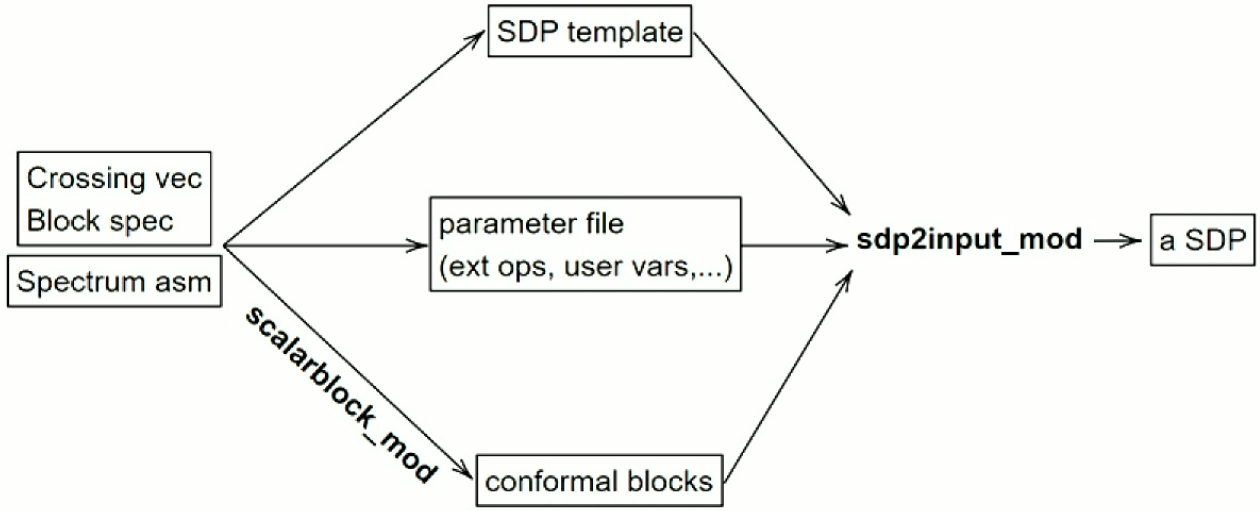

Proj_IsingOE
文件
主页
共享
查看
固定到快速访问
复制
粘贴
剪切
复制路径
粘贴快捷方式
移动到
复制到
删除
重命名
新建文件夹
新建项目
轻松访问
属性
打开
编辑
历史记录
全部选择
全部取消
反向选择
剪贴板
组织
新建
打开
选择
此电脑 › Windows (C:) › Users › shinn › OneDrive › talks › Perimeter_minicourse › slides › Tutorial1A2 › Proj_IsingOE
搜索"Proj_IsingOE"
Pictures
project_ga1ahad
talks
temp
ToPrinter
visa
Working
此电脑
3D 对象
下载
图片
文档
桌面
视频
音乐
Windows (C:)
LENOVO (D:)
Applications (E:)
Academia (F:)
名称
状态
修改日期
类型
大小
Proj_IsingOE_SDPTemplate.m
4/24/2023 7:51 PM
Wolfram Mathe...
166 KB
project_status.txt
4/21/2023 10:33 PM
文本文档
8 KB
2 个项目
选中 1 个项目 165 KB
同步被挂起
PI_S...
tut...
Isin...
con...
Peri...
Aut...
sim...
Proj...
设置
Sol...
ENG
7:51 PM
4/24/2023

simpleboot : run a SDP (high efficiency mode)



Advantage : very fast. All heavy computations are done in C++ programs

Disadvantage : simpleboot doesn't access to explicit SDP data (such as explicit crossing vectors $V_{\Delta,\ell}$).

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```
sdp
];
```

~Join~ : see the note

In[33]:=
```
(* save the template as default template for this project *)
AutoCB3$SaveSDPTemplate@SDPTemplate$IsingOE[];
```

Generate SDP

This function generate a SDP. It will be used by the Delaunay search scanner.
Input : a point to scan
Output : filename of the SDP

In[16]:=
```
SDP$IsingOE[point_List,filename_:Automatic]:=Module[
{Δσ,Δϵ},
{Δσ,Δϵ}=SetPrec[point];

AutoCB3$GenerateSDP[{Δσ,Δϵ},{},filename]
];
```

AutoCB3$GenerateSDP[externalOperatorList, userDefinedVariables, paramFilename]

AutoCB3$GenerateSDP call C++ programs to generate blocks (if the block data is not generated) and generate an actual SDP based on the template and user-defined variables

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user-defined variables

Input:
externalOperatorList: the values of the external operators. The order should match with "VBlock$External"
userDefinedVariables: user-defined variable in the template. Format : {"variable1"→value1, "variable2"→value2, ...}
paramFilename: SDP filename. Automatic : AutoCB3$GenerateSDP will choose a proper name automatically.

Output:
SDP filename

Delaunay Search

```
SSH$UploadCurrentNotebook[] (* save and upload current notebook as package (.m) to the cluster *)
```

```
initpts = {{0.5181489, 1.412625}} ~Join~ GeneratePointsInRectangular[{0.515, 0.523}, {1.38, 1.45}, 3, 3] // SetPrec;
initpts // ListPlot
```

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

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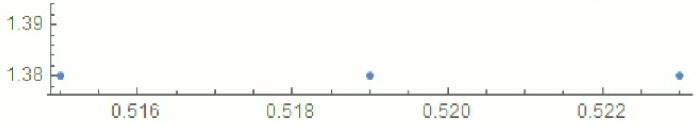


```
ClusterAsyn$Evaluate[
 AutoCB3$SaveSDPTemplate@SDPTemplate$IsingOE[];

 initpts = {{0.5181489, 1.412625}}~Join~GeneratePointsInRectangular[{0.515, 0.523}, {1.38, 1.45}, 3, 3] // SetPrec;

 SB$FeasibilityScanner[
  SDP$IsingOE, (* 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. *)
 ]
]
```

```
408919
```

```
(* Check the job output. Input : job ID *)
ClusterAsyn$JobOutput["408581"]
```

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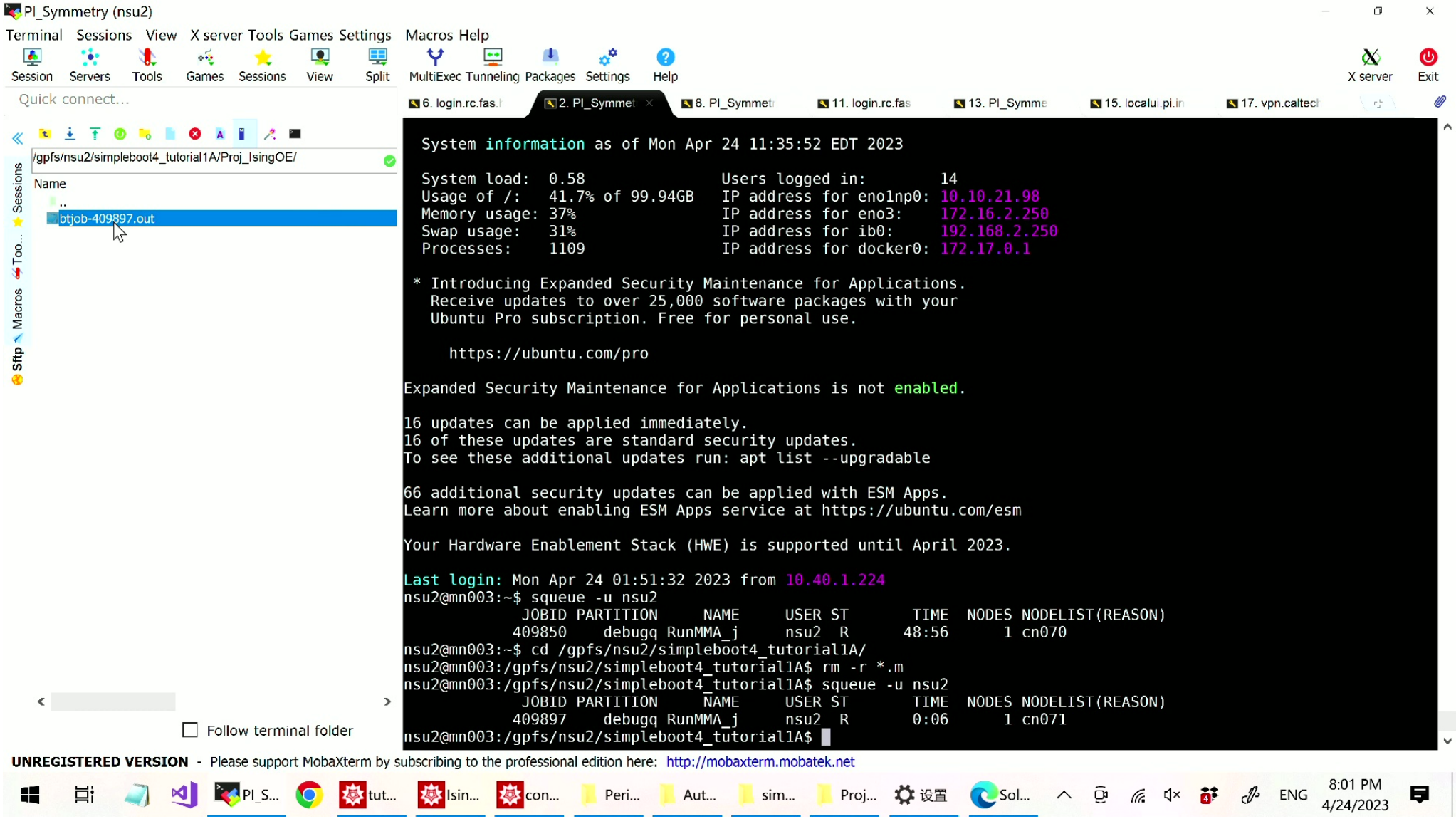
PI_Symmetry (nsu2)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit
Quick connect...
6. login.rc.fas.
2. PI_Symmet
8. PI_Symmet
11. login.rc.fas
13. PI_Symme
15. localui.pi.in
17. vpn.caltech
/gpfs/nsu2/simpleboot4_tutorial1A/Proj_IsingOE/
Name
..
btjob-409897.out
Sessions Too... Macros Sftp
Follow terminal folder
System information as of Mon Apr 24 11:35:52 EDT 2023
System load: 0.58 Users logged in: 14
Usage of /: 41.7% of 99.94GB IP address for eno1np0: 10.10.21.98
Memory usage: 37% IP address for eno3: 172.16.2.250
Swap usage: 31% IP address for ib0: 192.168.2.250
Processes: 1109 IP address for docker0: 172.17.0.1
* 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: Mon Apr 24 01:51:32 2023 from 10.40.1.224
nsu2@mn003:~$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
409850 debugq RunMMA_j nsu2 R 48:56 1 cn070
nsu2@mn003:~$ cd /gpfs/nsu2/simpleboot4_tutorial1A/
nsu2@mn003:/gpfs/nsu2/simpleboot4_tutorial1A$ rm -r *.m
nsu2@mn003:/gpfs/nsu2/simpleboot4_tutorial1A$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
409897 debugq RunMMA_j nsu2 R 0:06 1 cn071
nsu2@mn003:/gpfs/nsu2/simpleboot4_tutorial1A$
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Function : SB$AddPoints

Cluster control

Function : ClusterLoginNode$Evaluate

Function : ClusterAsyn$Evaluate, ClusterAsyn$JobOutput, ClusterAsyn$JobOutput$ToExpression

Function : ClusterAsyn$SDPBOutput

Function : ClusterSRUN$ReloadJobs

Miscellaneous

Function : ObjSet, ObjGet

Function : RunShell

Function : CheckDirectory

Simpleboot operation mode

To use full functionality, simpleboot need automatic SSH login and SLURM cluster.

Automatic SSH login : SSH can be configured to passwordless login based RSA keys. See .

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```
primalErrorThreshold          = 1e-15
dualErrorThreshold            = 1e-15
initialMatrixScalePrimal      = 1e+20
initialMatrixScaleDual        = 1e+20
feasibleCenteringParameter    = 0.1
infeasibleCenteringParameter  = 0.3
stepLengthReduction           = 0.7
maxComplementarity            = 1e+70
initialCheckpointDir          = "./Proj_IsingOE/SDPBFiles/0.518148900000_1.41262500000_Apr24_14h03m21s.ck"
checkpointDir                 = "./Proj_IsingOE/SDPBFiles/0.518148900000_1.41262500000_Apr24_14h03m21s.ck"
noFinalCheckpoint             = false
writeSolution                 = x,y
procsPerNode                  = 64
procGranularity               = 1
verbosity                     = 1
Performing a timing run
```

	time	mu	P-obj	D-obj	gap	P-err	p-err	D-err	P-step	D-step	beta
1	0	1.0e+40	+0.00	+0.00	0.00	+1.00e+20	+0.00	+1.80e+24	0.446	0.383	0.300
2	0	7.1e+39	-1.29e+20	+0.00	1.00	+5.54e+19	+5.24e-195	+1.11e+24	0.366	0.398	0.300
3	1	5.5e+39	-2.27e+20	+0.00	1.00	+3.51e+19	+4.91e-195	+6.69e+23	0.292	0.257	0.300
4	1	4.6e+39	-2.84e+20	+0.00	1.00	+2.49e+19	+5.94e-195	+4.98e+23	0.323	0.358	0.300
5	2	3.7e+39	-3.22e+20	+0.00	1.00	+1.68e+19	+7.24e-195	+3.20e+23	0.355	0.291	0.300
6	2	2.9e+39	-3.84e+20	+0.00	1.00	+1.09e+19	+1.06e-194	+2.27e+23	0.439	0.339	0.300
7	3	2.1e+39	-5.00e+20	+0.00	1.00	+6.09e+18	+5.39e-195	+1.50e+23	0.371	0.324	0.300

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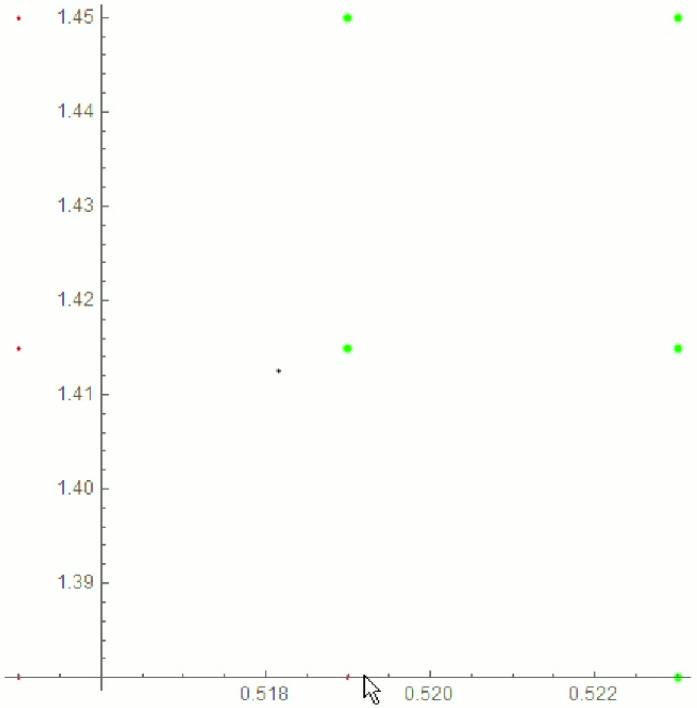
In[42]:=
```
SSH$DownloadFile@SB$Proj$FileName; (* download current project data from the cluster *)
SB$LoadProject[]; (* load current project data *)
```

In[44]:=
```
SB$DelaunayPlot[] (* plot the scan result *)
```

Out[44]=




```
SB$RawPlot[]
```

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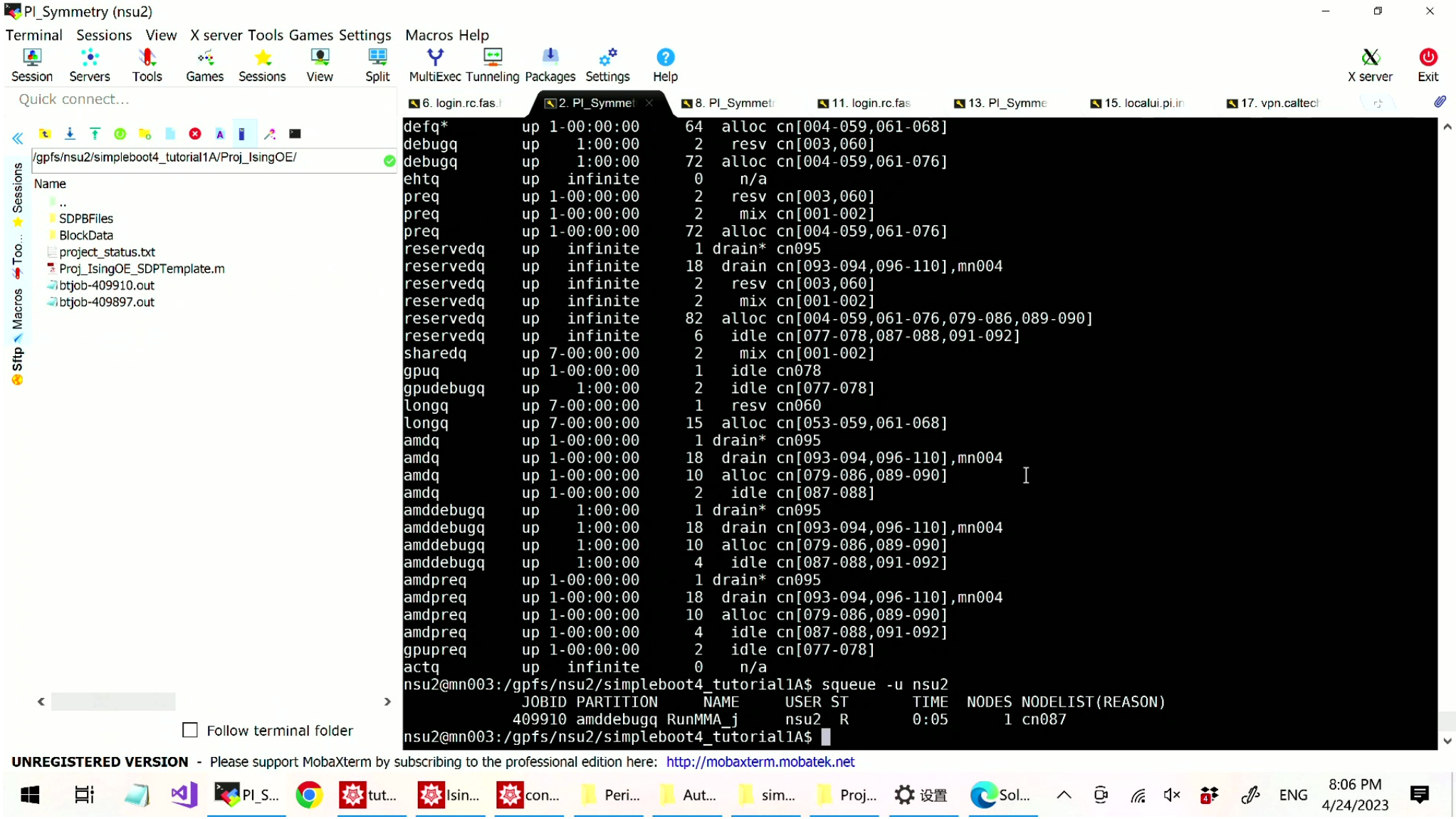
PI_Symmetry (nsu2)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help X server Exit
Quick connect...
6. login.rc.fas.l
2. PI_Symmet
8. PI_Symmetr
11. login.rc.fas
13. PI_Symme
15. localui.pi.in
17. vpn.caltech
/gpfs/nsu2/simpleboot4_tutorial1A/Proj_IsingOE/
Name
..
SDPBFiles
BlockData
project_status.txt
Proj_IsingOE_SDPTemplate.m
btjob-409910.out
btjob-409897.out
Sessions Too... Macros Sftp
Follow terminal folder
defq* up 1-00:00:00 64 alloc cn[004-059,061-068]
debugq up 1:00:00 2 resv cn[003,060]
debugq up 1:00:00 72 alloc cn[004-059,061-076]
ehtq up infinite 0 n/a
preq up 1-00:00:00 2 resv cn[003,060]
preq up 1-00:00:00 2 mix cn[001-002]
preq up 1-00:00:00 72 alloc cn[004-059,061-076]
reservedq up infinite 1 drain* cn095
reservedq up infinite 18 drain cn[093-094,096-110],mn004
reservedq up infinite 2 resv cn[003,060]
reservedq up infinite 2 mix cn[001-002]
reservedq up infinite 82 alloc cn[004-059,061-076,079-086,089-090]
reservedq up infinite 6 idle cn[077-078,087-088,091-092]
sharedq up 7-00:00:00 2 mix cn[001-002]
gpuq up 1-00:00:00 1 idle cn078
gpudebugq up 1:00:00 2 idle cn[077-078]
longq up 7-00:00:00 1 resv cn060
longq up 7-00:00:00 15 alloc cn[053-059,061-068]
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 10 alloc cn[079-086,089-090]
amdq up 1-00:00:00 2 idle cn[087-088]
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 10 alloc cn[079-086,089-090]
amddebugq up 1:00:00 4 idle cn[087-088,091-092]
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 10 alloc cn[079-086,089-090]
amdpreq up 1-00:00:00 4 idle cn[087-088,091-092]
gpupreq up 1-00:00:00 2 idle cn[077-078]
actq up infinite 0 n/a
nsu2@mn003:/gpfs/nsu2/simpleboot4_tutorial1A$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
409910 amddebugq RunMMA_j nsu2 R 0:05 1 cn087
nsu2@mn003:/gpfs/nsu2/simpleboot4_tutorial1A$
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```
SB$RawPlot[]
```

utility codes

check job output and SDPB output

```
(* Check the job output. Input : job ID *)
ClusterAsyn$JobOutput["407653"]
(* Check the SDPB output. Input : SDP file name *)
ClusterAsyn$SDPBOutput["0.515000000000_1.44999300000_Apr17_20h10m02s.sdp"]
SB$LoadProject[];
ClusterAsyn$SDPBOutput@ObjGet[SB$Proj$calculated$dual, 1, "LastCheckpoint"]
```

download the project data and monitor the result in real time

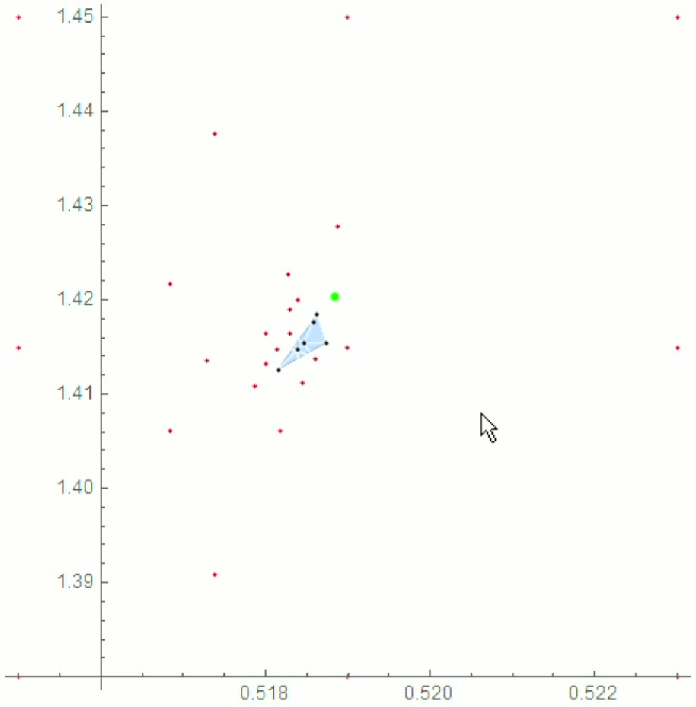
```
(* download the project data every 1s and plot the data *)
Monitor[
 While[True,
   Pause[1];
   SSH$DownloadFile@SB$Proj$FileName;
  ];
```

120%

IsingOE.nb * (Running...) - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
, Refresh[SB$DelaunayPlot[], UpdateInterval → 1]]
```

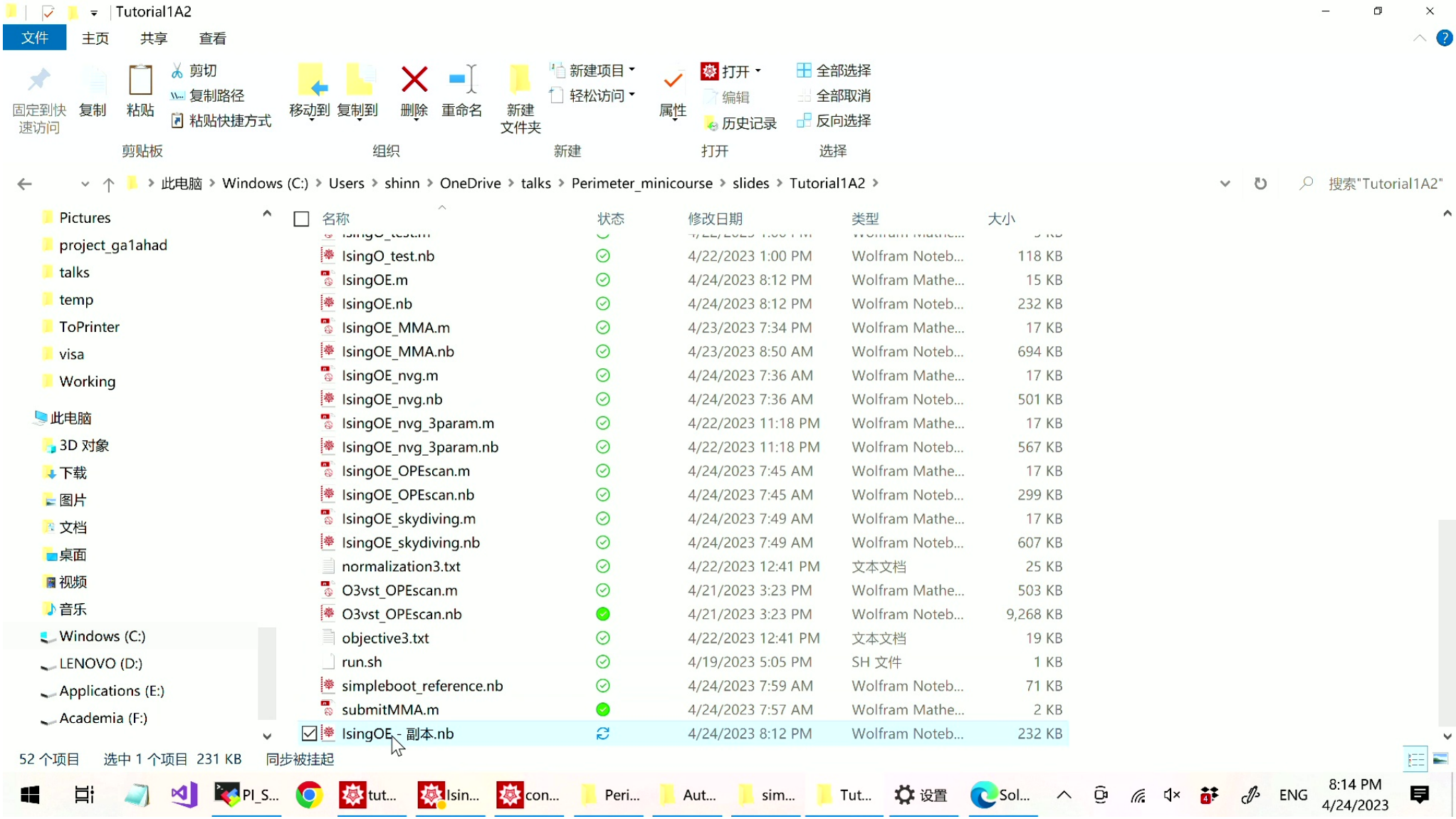


cancel all jobs

```
(* ClusterLoginNode$Evaluate: execute MMA command on the login node of the cluster *)
ClusterLoginNode$Evaluate[
 (* RunShell : execute a shell command *)
```

120%

PI_S... tut... Isin... con... Peri... Aut... sim... Proj... 设置 Sol... ENG 8:11 PM 4/24/2023


Tutorial1A2
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
剪贴板
移动到 复制到 删除 重命名 新建文件夹 新建项目 轻松访问
组织 新建
属性 打开 编辑 历史记录 全部选择 全部取消 反向选择
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此电脑 › Windows (C:) › Users › shinn › OneDrive › talks › Perimeter_minicourse › slides › Tutorial1A2 ›
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ToPrinter
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文档
桌面
视频
音乐
Windows (C:)
LENOVO (D:)
Applications (E:)
Academia (F:)
名称 状态 修改日期 类型 大小
IsingO_test.nb 4/22/2023 1:00 PM Wolfram Noteb... 118 KB
IsingOE.m 4/24/2023 8:12 PM Wolfram Mathe... 15 KB
IsingOE.nb 4/24/2023 8:12 PM Wolfram Noteb... 232 KB
IsingOE_MMA.m 4/23/2023 7:34 PM Wolfram Mathe... 17 KB
IsingOE_MMA.nb 4/23/2023 8:50 AM Wolfram Noteb... 694 KB
IsingOE_nvg.m 4/24/2023 7:36 AM Wolfram Mathe... 17 KB
IsingOE_nvg.nb 4/24/2023 7:36 AM Wolfram Noteb... 501 KB
IsingOE_nvg_3param.m 4/22/2023 11:18 PM Wolfram Mathe... 17 KB
IsingOE_nvg_3param.nb 4/22/2023 11:18 PM Wolfram Noteb... 567 KB
IsingOE_OPEscan.m 4/24/2023 7:45 AM Wolfram Mathe... 17 KB
IsingOE_OPEscan.nb 4/24/2023 7:45 AM Wolfram Noteb... 299 KB
IsingOE_skydiving.m 4/24/2023 7:49 AM Wolfram Mathe... 17 KB
IsingOE_skydiving.nb 4/24/2023 7:49 AM Wolfram Noteb... 607 KB
normalization3.txt 4/22/2023 12:41 PM 文本文档 25 KB
O3vst_OPEscan.m 4/21/2023 3:23 PM Wolfram Mathe... 503 KB
O3vst_OPEscan.nb 4/21/2023 3:23 PM Wolfram Noteb... 9,268 KB
objective3.txt 4/22/2023 12:41 PM 文本文档 19 KB
run.sh 4/19/2023 5:05 PM SH 文件 1 KB
simpleboot_reference.nb 4/24/2023 7:59 AM Wolfram Noteb... 71 KB
submitMMA.m 4/24/2023 7:57 AM Wolfram Mathe... 2 KB
IsingOE - 副本.nb 4/24/2023 8:12 PM Wolfram Noteb... 232 KB
52 个项目 选中 1 个项目 231 KB 同步被挂起
PI_S... tut... Isin... con... Peri... Aut... sim... Tut... 设置 Sol...
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IsingOE2.nb - Wolfram Mathematica 11.1

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```
Null
```

Manually add points for Delaunay scanner to scan

```
(* ClusterLoginNode$Evaluate: execute MMA command on the login node of the cluster *)
ClusterLoginNode$Evaluate[
 (* Cluster$AddPoints : add a list of point for the scanner to compute *)
 Cluster$AddPoints[
  {{0.5177491433922756, 1.4069517019543976`}, {0.517380791833411, 1.4042418752442998`},
    {0.5170706010469988, 1.4008545918566775`}, {0.520560247394137, 1.4294771364820849`},
    {0.5207153427873431, 1.432864419869707}, {0.5216846889948815, 1.4352355182410423`}} // SetPrec]
]
```

Add a test region for Delaunay scanner

```
ClusterLoginNode$Evaluate[
 (* Add a test region in the Delaunay scanner. The scanner will only search for new points inside the test region. *)
 SB$LockProject[];
 ObjSet[SB$Proj, "method"] =
  {"sampler" → "Delaunay",
   "Region" → Polygon@{{0.5171516665322581, 1.3974831977419353`}, {0.5189660012096774, 1.4049190132258063`},
      {0.5175772512096775, 1.4133332254838709`}, {0.5163900939516128, 1.4025708609677416`}}};
 SB$UnlockProject[];
]

ClusterLoginNode$Evaluate[
```

120%

IsingOE2.nb * - Wolfram Mathematica 11.1

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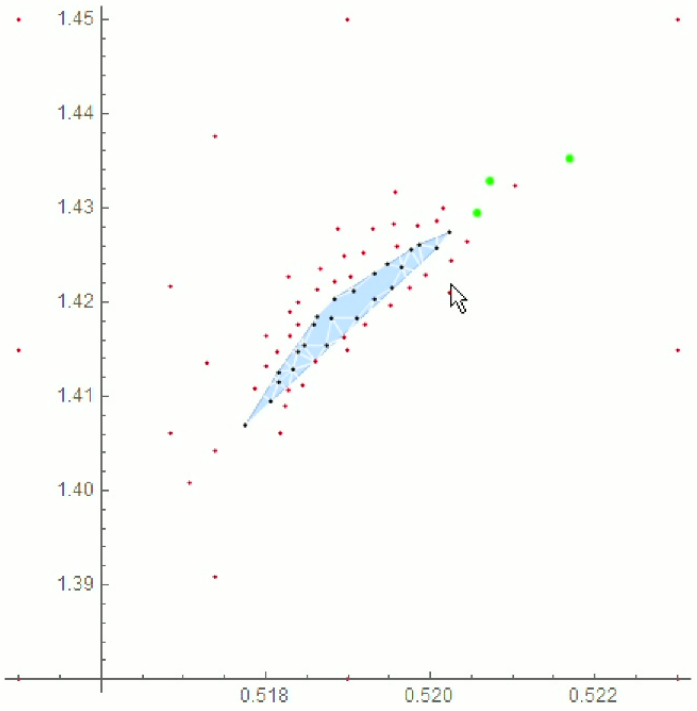
```
(* Check the SDPB output. Input : SDP file name *)
ClusterAsyn$SDPBOutput["0.518148900000_1.41262500000_Apr24_14h03m21s.sdp"]
```

In[24]:=
```
SSH$DownloadFile@SB$Proj$FileName; (* download current project data from the cluster *)
SB$LoadProject[]; (* load current project data *)
```

In[26]:=
```
SB$DelaunayPlot[] (* plot the scan result *)
```

Out[26]=

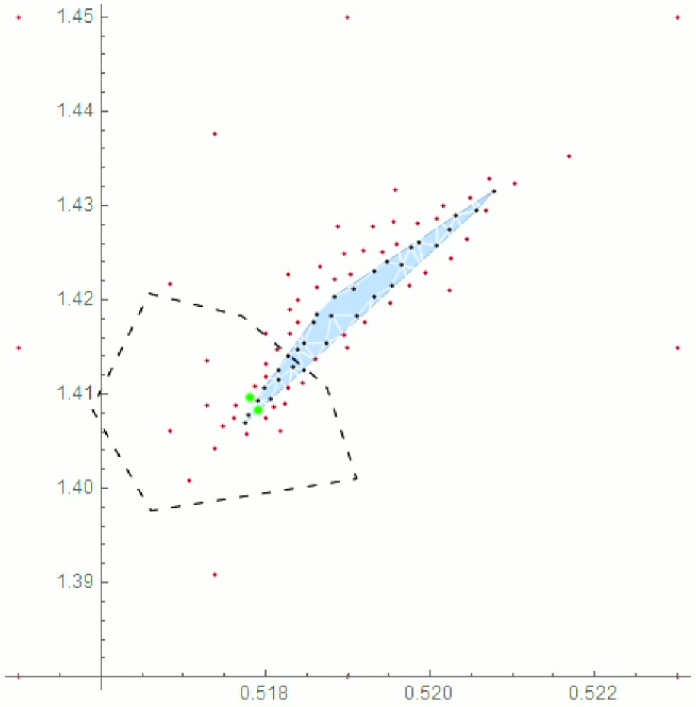


120%

IsingOE.nb (Running...) - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

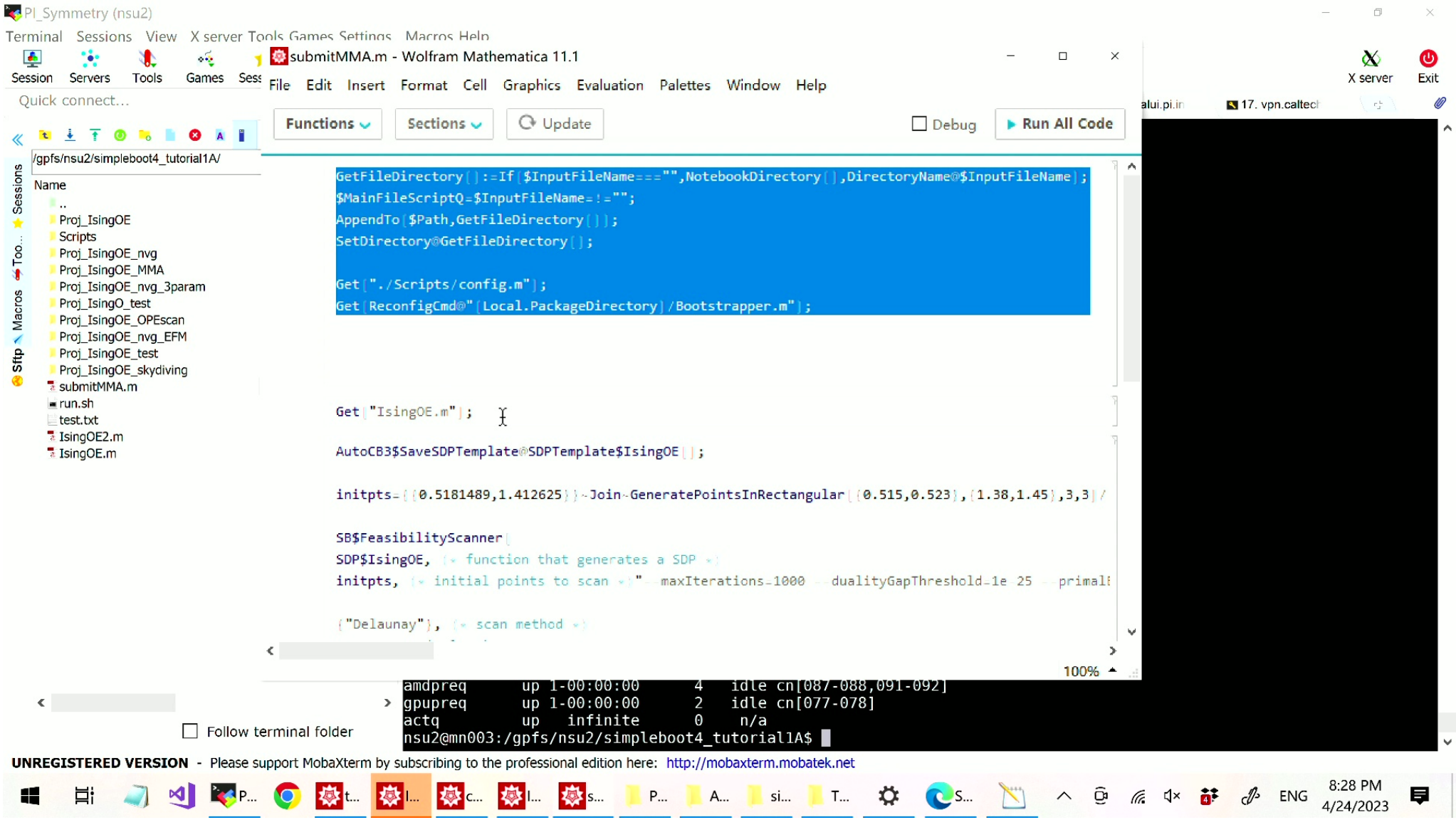
```
, Refresh[SB$DelaunayPlot[], UpdateInterval → 1]]
```



cancel all jobs

```
(* ClusterLoginNode$Evaluate: execute MMA command on the login node of the cluster *)
ClusterLoginNode$Evaluate[
 (* RunShell : execute a shell command *)
```

120%


PI_Symmetry (nsu2)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games
Quick connect...
/gpfs/nsu2/simpleboot4_tutorial1A/
Name
..
Proj_IsingOE
Scripts
Proj_IsingOE_nvg
Proj_IsingOE_MMA
Proj_IsingOE_nvg_3param
Proj_IsingO_test
Proj_IsingOE_OPEscan
Proj_IsingOE_nvg_EFM
Proj_IsingOE_test
Proj_IsingOE_skydiving
submitMMA.m
run.sh
test.txt
IsingOE2.m
IsingOE.m
Follow terminal folder
submitMMA.m - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
Functions
Sections
Update
Debug
Run All Code
GetFileDirectory[]:=If[$InputFileName===""",NotebookDirectory[],DirectoryName@$InputFileName];
$MainFileScriptQ=$InputFileName=!="";
AppendTo[$Path,GetFileDirectory[]];
SetDirectory@GetFileDirectory[];
Get["./Scripts/config.m"];
Get[ReconfigCmd@"[Local.PackageDirectory]/Bootstrapper.m"];
Get["IsingOE.m"];
AutoCB3$SaveSDPTemplate@SDPTemplate$IsingOE[];
initpts={{0.5181489,1.412625}}~Join~GeneratePointsInRectangular[{0.515,0.523},{1.38,1.45},3,3]/
SB$FeasibilityScanner[
SDP$IsingOE, (* function that generates a SDP *)
initpts, (* initial points to scan *)" maxIterations=1000 dualityGapThreshold=1e 25 primal
{"Delaunay"}, (* scan method *)
100%
X server
Exit
17. vpn.caltech
amdpreq up 1-00:00:00 4 idle cn[087-088,091-092]
gpupreq up 1-00:00:00 2 idle cn[077-078]
actq up infinite 0 n/a
nsu2@mn003:/gpfs/nsu2/simpleboot4_tutorial1A$
UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: http://mobaxterm.mobatek.net
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Exercise_Tutorial1A.nb - Wolfram Mathematica 11.1

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This is a long exercise set. But the computation is pretty quick for $\Lambda = 11$ (around 10mins to ~1 hour).

For perimeter user:
We are sharing limited computational resources among many participants. Please don't do heavy computations. For debugging, you can use debugq. Once the code runs correctly for 10mins, you can stop it and re-run it on defq. Once the feasible region have rough sharp (usually around 100 to 200 points), you can stop the computation.

Try to do Exercise 1-3 today. Try to finish Exercise 4 by Thursday (it's related to what I want to discuss on Thursday).

Exercise 1

Go through IsingOE.nb to understand how the bootstrap conditions are set up.
Execute IsingOE.nb to scan a 3D Ising island.

Exercise 2

Go through IsingO.nb to understand how to use user-defined variables.
Execute IsingO.nb to scan single correlator for 3D Ising.

Exercise 3

Modify IsingO.nb to scan single correlator bound for 3D O(N). You can use the crossing vector from ArXiv:1307.6856 (2.5).

In simpleboot, the default definition of conformal block is in ArXiv:1805.04405 TABLE I row 1, while the convention of ArXiv:1307.6856 is in row 5. Therefore there is a $(-1)^{l}$ difference for $V_{\Delta,\Delta,l}$. When you type in crossing vector, you should take minus of $V_{\Delta,\Delta,l}$ in ArXiv:1307.6856 (2.5).

Exercise 4

100%

Applications (E:)
Academia (F:)

IsingOE_nvg.m	4/24/2023 7:36 AM	Wolfram Mathe...	17 KB
IsingOE_nvg.nb	4/24/2023 7:36 AM	Wolfram Noteb...	501 KB

53 个项目 选中 1 个项目 20.0 KB 在此设备上可用

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