Title: Tutorial 5B: Skydiving examples. After-session projects

Speakers: Ning Su

Collection: Mini-Course of Numerical Conformal Bootstrap

Date: April 28, 2023 - 3:30 PM

URL: https://pirsa.org/23040150

testrun.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
(* 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"];
CheckDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]"];
```

crossing vector

```
crossvecobj={"VBlock"→{
op[op,"S",1,1]→(0
                F[v,v,v,v]
                H[v,v,v,v]),
```

120%

11 个项目　选中 1 个项目 81.9 KB　在此设备上可用

PI_Symmetry (n... IsingOE_nvg.nb ... testrun.nb - Wo... Welcome to the... Tutorial5B

slides finished autoboot testrun

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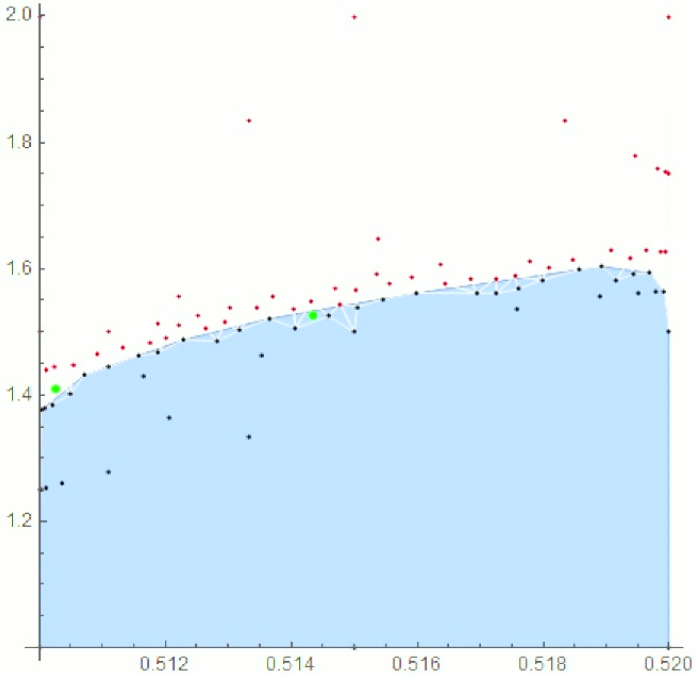
```
SB$DelaunayPlot[]
```




```
ObjGet[SB$Proj, "calculated", All, "DeltaList"]
```

```
{{0.51, 1.}, {0.51, 1.49995}, {0.51, 1.9999}, {0.515, 1.}, {0.515, 1.49995}, {0.515, 1.9999}, {0.519999, 1.}, {0.519999, 1.49995},
```

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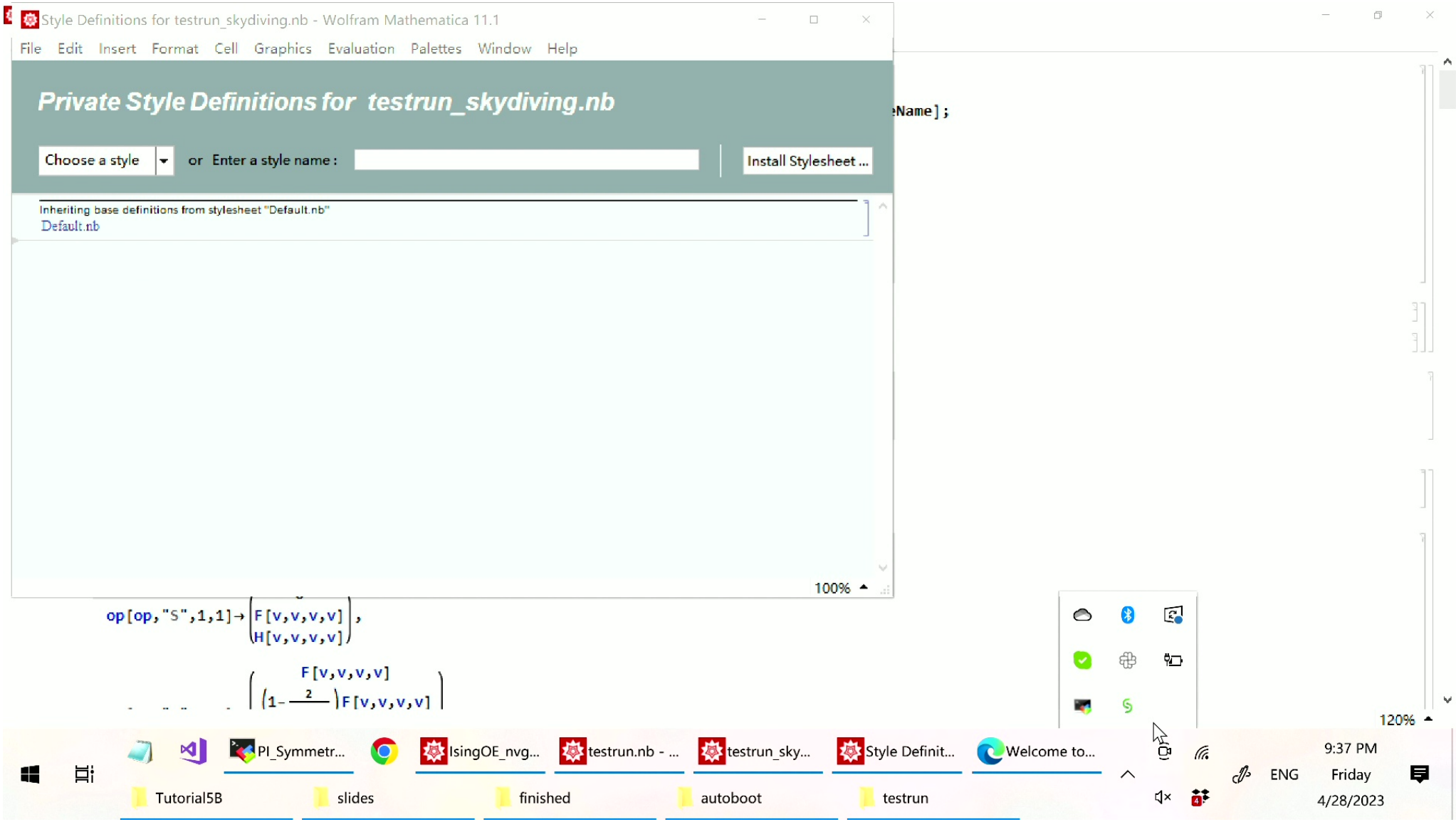
Style Definitions for testrun_skydiving.nb - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
Private Style Definitions for testrun_skydiving.nb
Choose a style
or Enter a style name :
Install Stylesheet ...
Inheriting base definitions from stylesheet "Default.nb"
Default.nb
100%
eName];
op[op,"S",1,1]→ F[v,v,v,v] H[v,v,v,v] ,
F[v,v,v,v]
(1- 2)F[v,v,v,v]
120%
PI_Symmetr...
IsingOE_nvg...
testrun.nb - ...
testrun_sky...
Style Definit...
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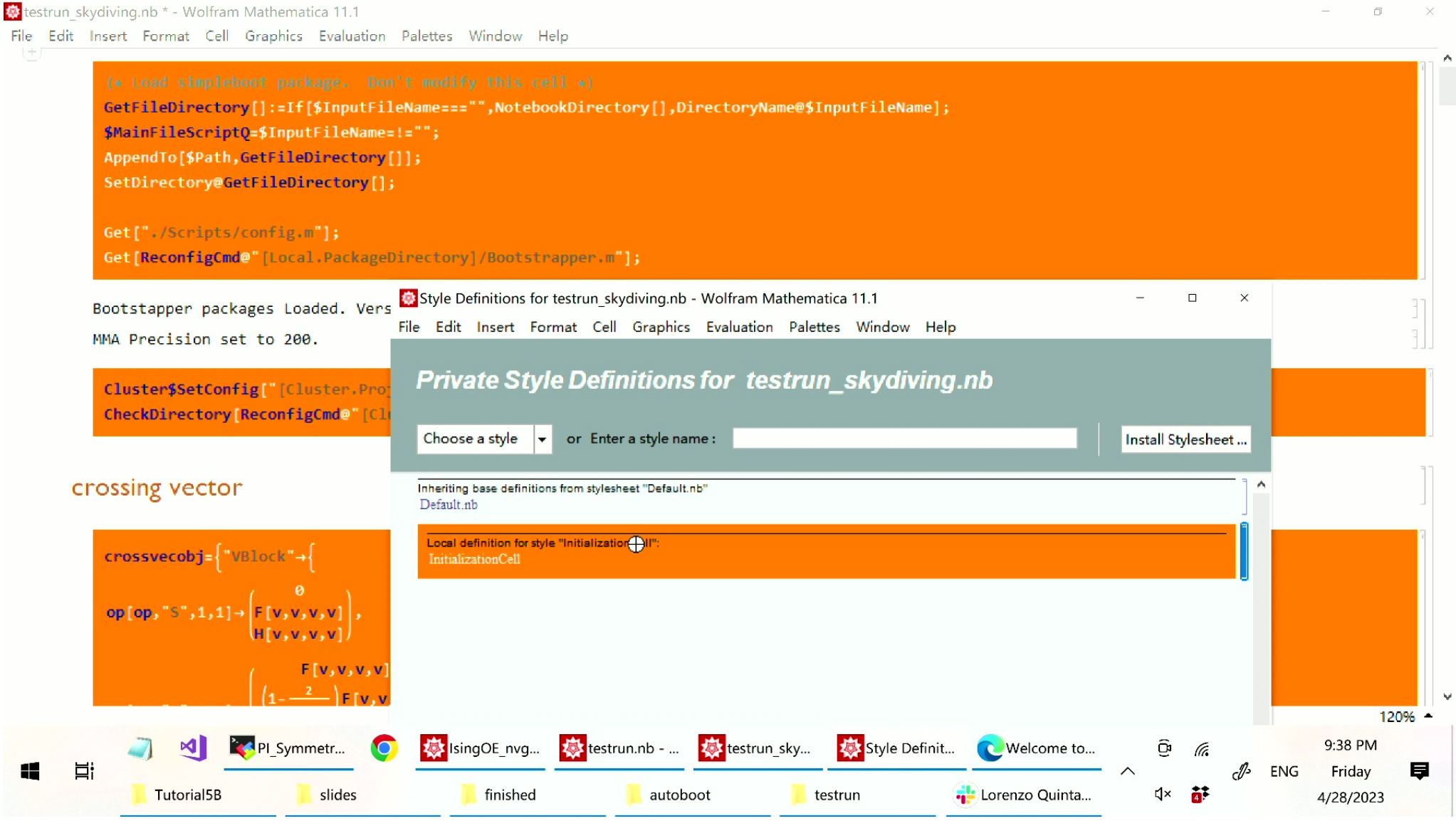
testrun_skydiving.nb * - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
(* Load simpleboot package. Don't modify this cell *)
GetFileDirectory[]:=If[$InputFileName==="",NotebookDirectory[],DirectoryName@$InputFileName];
$MainFileScriptQ=$InputFileName=!="";
AppendTo[$Path,GetFileDirectory[]];
SetDirectory@GetFileDirectory[];
Get["./Scripts/config.m"];
Get[ReconfigCmd@"[Local.PackageDirectory]/Bootstrapper.m"];
Bootstapper packages Loaded. Vers
MMA Precision set to 200.
Cluster$SetConfig["[Cluster.Pro
CheckDirectory[ReconfigCmd@"[Cl
crossing vector
crossvecobj={"VBlock"→{
op[op,"S",1,1]→
Style Definitions for testrun_skydiving.nb - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
Private Style Definitions for testrun_skydiving.nb
Choose a style
or Enter a style name :
Install Stylesheet ...
Inheriting base definitions from stylesheet "Default.nb"
Default.nb
Local definition for style "Initialization":
InitializationCell
120%
PI_Symmetr...
IsingOE_nvg...
testrun.nb - ...
testrun_sky...
Style Definit...
Welcome to...
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testrun
Lorenzo Quinta...

testrun_skydiving.nb - Wolfram Mathematica 11.1

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```
"VBlock$Deriv"→{"odd", "odd", "even"},  (* indicate the 5 compenents are even/odd under u<->v exchange *)
"VBlock$External"→{"v"} (* the name of external operators as String *)
};
```

block spec

```
blockConfObj={"dim"→3,"Δmax"→11,"κ"→12,"rN"→48,"lset"→Range[0,20]~Join~{49,52}};
```

initialize simpleboot

```
AutoCB3$Init[crossvecobj,blockConfObj];
```

SDP template

```
ObjGet[crossvecobj, "VBlock"][[All, 1]]
{op[op, S, 1, 1], op[op, T, 1, 1], op[op, A, 1, -1]}
```

```
GapConfiguration[dim_,lset_]:={
```

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PI_Symmetr... IsingOE_nvg... testrun.nb - ... testrun_sky... Welcome to... Tutorial5B

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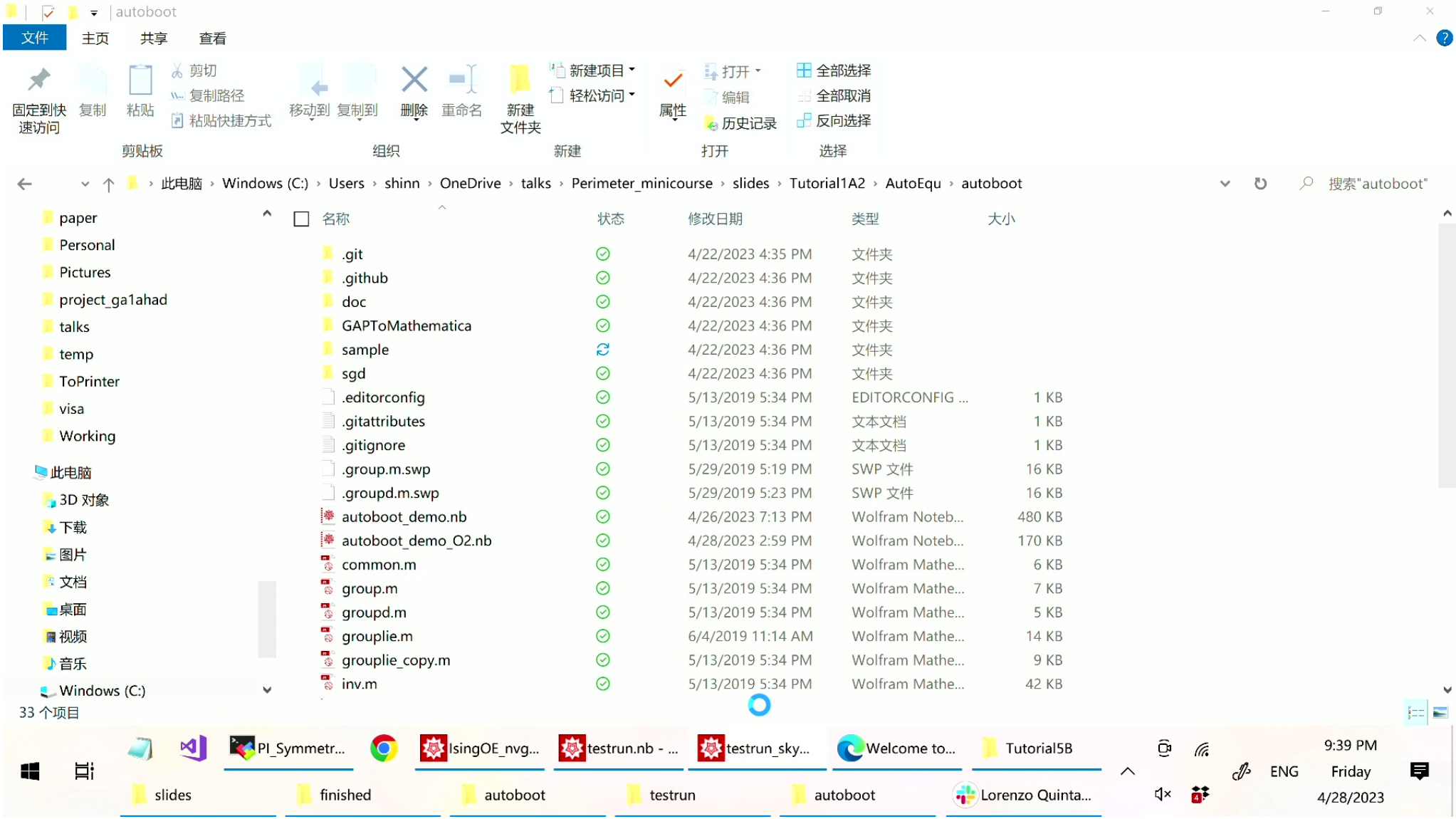
autoboot
文件
主页
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固定到快速访问
复制
粘贴
剪切
复制路径
粘贴快捷方式
移动到
复制到
删除
重命名
新建文件夹
新建项目
轻松访问
属性
打开
编辑
历史记录
全部选择
全部取消
反向选择
剪贴板
组织
新建
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选择
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.github 4/22/2023 4:36 PM 文件夹
doc 4/22/2023 4:36 PM 文件夹
GAPToMathematica 4/22/2023 4:36 PM 文件夹
sample 4/22/2023 4:36 PM 文件夹
sgd 4/22/2023 4:36 PM 文件夹
.editorconfig 5/13/2019 5:34 PM EDITORCONFIG ... 1 KB
.gitattributes 5/13/2019 5:34 PM 文本文档 1 KB
.gitignore 5/13/2019 5:34 PM 文本文档 1 KB
.group.m.swp 5/29/2019 5:19 PM SWP 文件 16 KB
.groupd.m.swp 5/29/2019 5:23 PM SWP 文件 16 KB
autoboot_demo.nb 4/26/2023 7:13 PM Wolfram Noteb... 480 KB
autoboot_demo_O2.nb 4/28/2023 2:59 PM Wolfram Noteb... 170 KB
common.m 5/13/2019 5:34 PM Wolfram Mathe... 6 KB
group.m 5/13/2019 5:34 PM Wolfram Mathe... 7 KB
groupd.m 5/13/2019 5:34 PM Wolfram Mathe... 5 KB
grouplie.m 6/4/2019 11:14 AM Wolfram Mathe... 14 KB
grouplie_copy.m 5/13/2019 5:34 PM Wolfram Mathe... 9 KB
inv.m 5/13/2019 5:34 PM Wolfram Mathe... 42 KB
33 个项目
PI_Symmetr...
IsingOE_nvg...
testrun.nb - ...
testrun_sky...
Welcome to...
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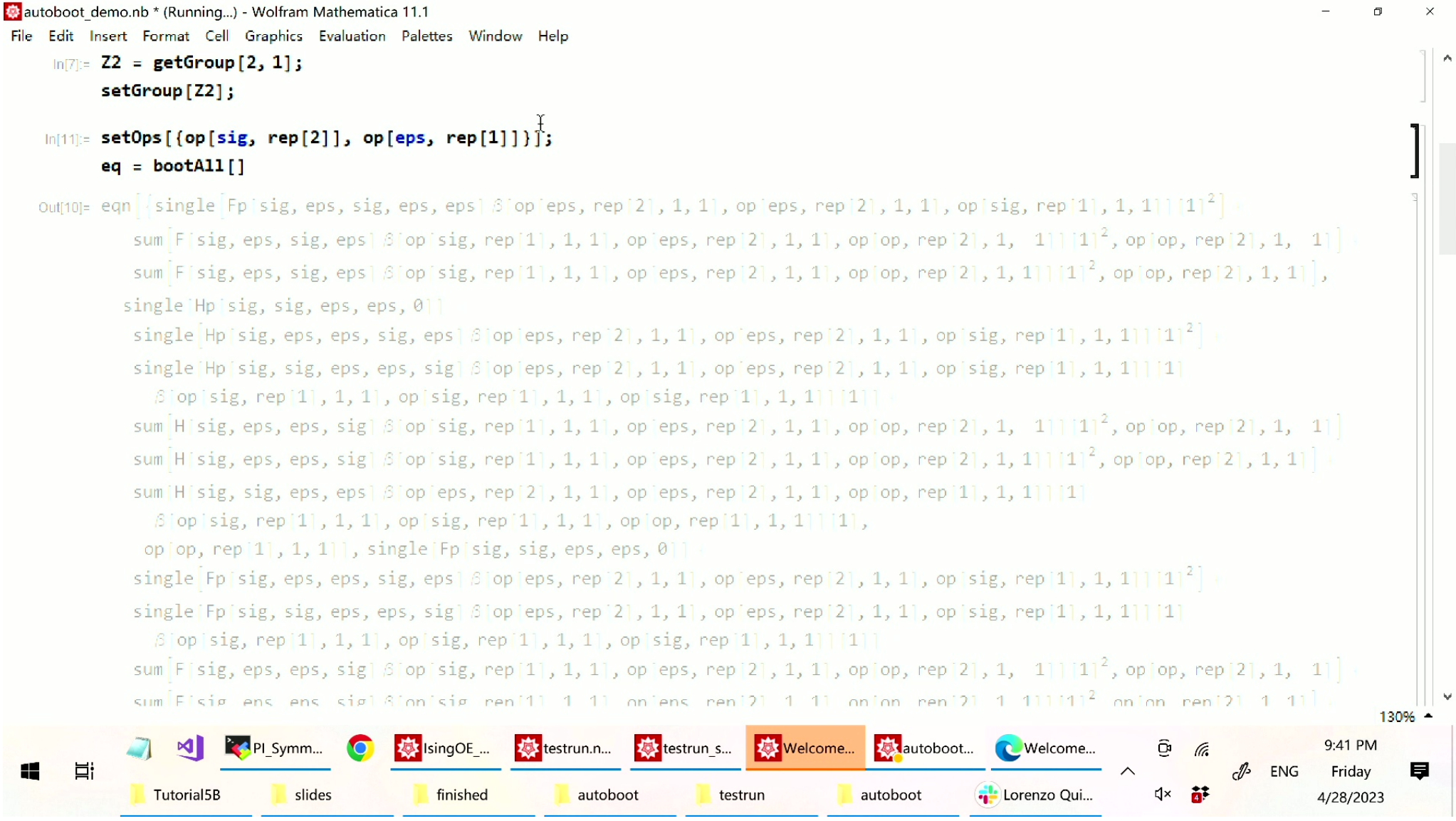
autoboot_demo.nb * (Running...) - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
In[7]:= Z2 = getGroup[2, 1];
setGroup[Z2];
In[11]:= setOps[{op[sig, rep[2]], op[eps, rep[1]]}];
eq = bootAll[]
Out[10]= eqn[{single[Fp[sig, eps, sig, eps, eps]@op[eps, rep[2], 1, 1], op[eps, rep[2], 1, 1], op[sig, rep[1], 1, 1]][1]^2] +
sum[F[sig, eps, sig, eps]@op[sig, rep[1], 1, 1], op[eps, rep[2], 1, 1], op[op, rep[2], 1, 1]][1]^2, op[op, rep[2], 1, 1]] +
sum[F[sig, eps, sig, eps]@op[sig, rep[1], 1, 1], op[eps, rep[2], 1, 1], op[op, rep[2], 1, 1]][1]^2, op[op, rep[2], 1, 1]],
single[Hp[sig, sig, eps, eps, 0]] +
single[Hp[sig, eps, eps, sig, eps]@op[eps, rep[2], 1, 1], op[eps, rep[2], 1, 1], op[sig, rep[1], 1, 1]][1]^2] +
single[Hp[sig, sig, eps, eps, sig]@op[eps, rep[2], 1, 1], op[eps, rep[2], 1, 1], op[sig, rep[1], 1, 1]][1]
@op[sig, rep[1], 1, 1], op[sig, rep[1], 1, 1], op[sig, rep[1], 1, 1]][1]] +
sum[H[sig, eps, eps, sig]@op[sig, rep[1], 1, 1], op[eps, rep[2], 1, 1], op[op, rep[2], 1, 1]][1]^2, op[op, rep[2], 1, 1]] +
sum[H[sig, eps, eps, sig]@op[sig, rep[1], 1, 1], op[eps, rep[2], 1, 1], op[op, rep[2], 1, 1]][1]^2, op[op, rep[2], 1, 1]] +
sum[H[sig, sig, eps, eps]@op[eps, rep[2], 1, 1], op[eps, rep[2], 1, 1], op[op, rep[1], 1, 1]][1]
@op[sig, rep[1], 1, 1], op[sig, rep[1], 1, 1], op[op, rep[1], 1, 1]][1],
op[op, rep[1], 1, 1]], single[Fp[sig, sig, eps, eps, 0]] +
single[Fp[sig, eps, eps, sig, eps]@op[eps, rep[2], 1, 1], op[eps, rep[2], 1, 1], op[sig, rep[1], 1, 1]][1]^2] +
single[Fp[sig, sig, eps, eps, sig]@op[eps, rep[2], 1, 1], op[eps, rep[2], 1, 1], op[sig, rep[1], 1, 1]][1]
@op[sig, rep[1], 1, 1], op[sig, rep[1], 1, 1], op[sig, rep[1], 1, 1]][1]] +
sum[F[sig, eps, eps, sig]@op[sig, rep[1], 1, 1], op[eps, rep[2], 1, 1], op[op, rep[2], 1, 1]][1]^2, op[op, rep[2], 1, 1]] +
130%
PI_Symm... IsingOE_... testrun.n... testrun_s... Welcome... autoboot... Welcome...
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ENG
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Tutorial5B slides finished autoboot testrun autoboot Lorenzo Qui...

autoboot_demo.nb - Wolfram Mathematica 11.1

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```
    β[op[sig, rep[2], 1, 1], op[sig, rep[2], 1, 1], op[op, rep[1], 1, 1]][1],
   op[op, rep[1], 1, 1]], single[Fp[sig, sig, sig, sig, 0]] +
  single[Fp[sig, sig, sig, sig, eps] β[op[sig, rep[2], 1, 1], op[sig, rep[2], 1, 1], op[eps, rep[1], 1, 1]][1]^2] +
  sum[F[sig, sig, sig, sig] β[op[sig, rep[2], 1, 1], op[sig, rep[2], 1, 1], op[op, rep[1], 1, 1]][1]^2, op[op, rep[1], 1, 1]],
 single[Fp[eps, eps, eps, eps, 0]] +
  single[Fp[eps, eps, eps, eps, eps] β[op[eps, rep[1], 1, 1], op[eps, rep[1], 1, 1], op[eps, rep[1], 1, 1]][1]^2] +
  sum[F[eps, eps, eps, eps] β[op[eps, rep[1], 1, 1], op[eps, rep[1], 1, 1], op[op, rep[1], 1, 1]][1]^2, op[op, rep[1], 1, 1]]}]
```

O(2)

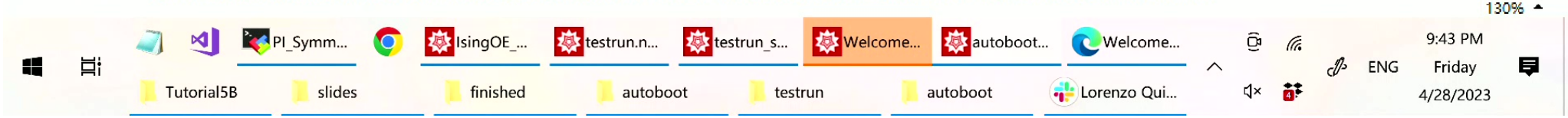
vs

In[5]:=
```
o2 = getO[2];
setGroup[o2];

setOps[{op[s, o2[id]], op[v, v[1]]}];
eq = bootAll[]
```

eqn
```
{single[Fp[s, v, s, v, v] β[op[v, v[1], 1, 1], op[v, v[1], 1, 1], op[s, i[1], 1, 1]][1]^2] +
 sum[F[s, v, s, v] β[op[s, i[1], 1, 1], op[v, v[1], 1, 1], op[op, v[1], 1, -1]][1]^2, op[op, v[1], 1, -1]] +
 sum[F[s, v, s, v] β[op[s, i[1], 1, 1], op[v, v[1], 1, 1], op[op, v[1], 1, 1]][1]^2, op[op, v[1], 1, 1]],
```

130%



demo_crossVecObj.nb * - Wolfram Mathematica 11.1

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$$\frac{1}{2}\,\text{sum}\left[H[v,v,v,v]\,\beta[\text{op}[v,v[1],1,1],\text{op}[v,v[1],1,1],\text{op}[\text{op},i[-1],1,-1]][1]^2,\text{op}[\text{op},i[-1],1,-1]\right] +$$

$$\frac{1}{2}\,\text{sum}\left[H[v,v,v,v]\,\beta[\text{op}[v,v[1],1,1],\text{op}[v,v[1],1,1],\text{op}[\text{op},i[1],1,1]][1]^2,\text{op}[\text{op},i[1],1,1]\right] -$$

$$\frac{1}{2}\,\text{sum}\left[H[v,v,v,v]\,\beta[\text{op}[v,v[1],1,1],\text{op}[v,v[1],1,1],\text{op}[\text{op},v[2],1,1]][1]^2,\text{op}[\text{op},v[2],1,1]\right],$$

$$\text{single}[Fp[s,s,s,s,0]] + \text{single}\left[Fp[s,s,s,s,s]\,\beta[\text{op}[s,i[1],1,1],\text{op}[s,i[1],1,1],\text{op}[s,i[1],1,1]][1]^2\right] +$$

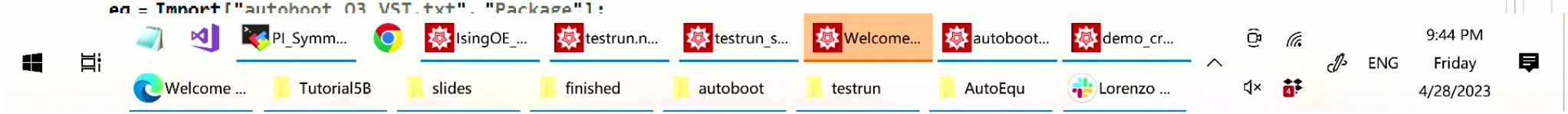
$$\text{sum}\left[F[s,s,s,s]\,\beta[\text{op}[s,i[1],1,1],\text{op}[s,i[1],1,1],\text{op}[\text{op},i[1],1,1]][1]^2,\text{op}[\text{op},i[1],1,1]\right]\Big\}\Big]$$

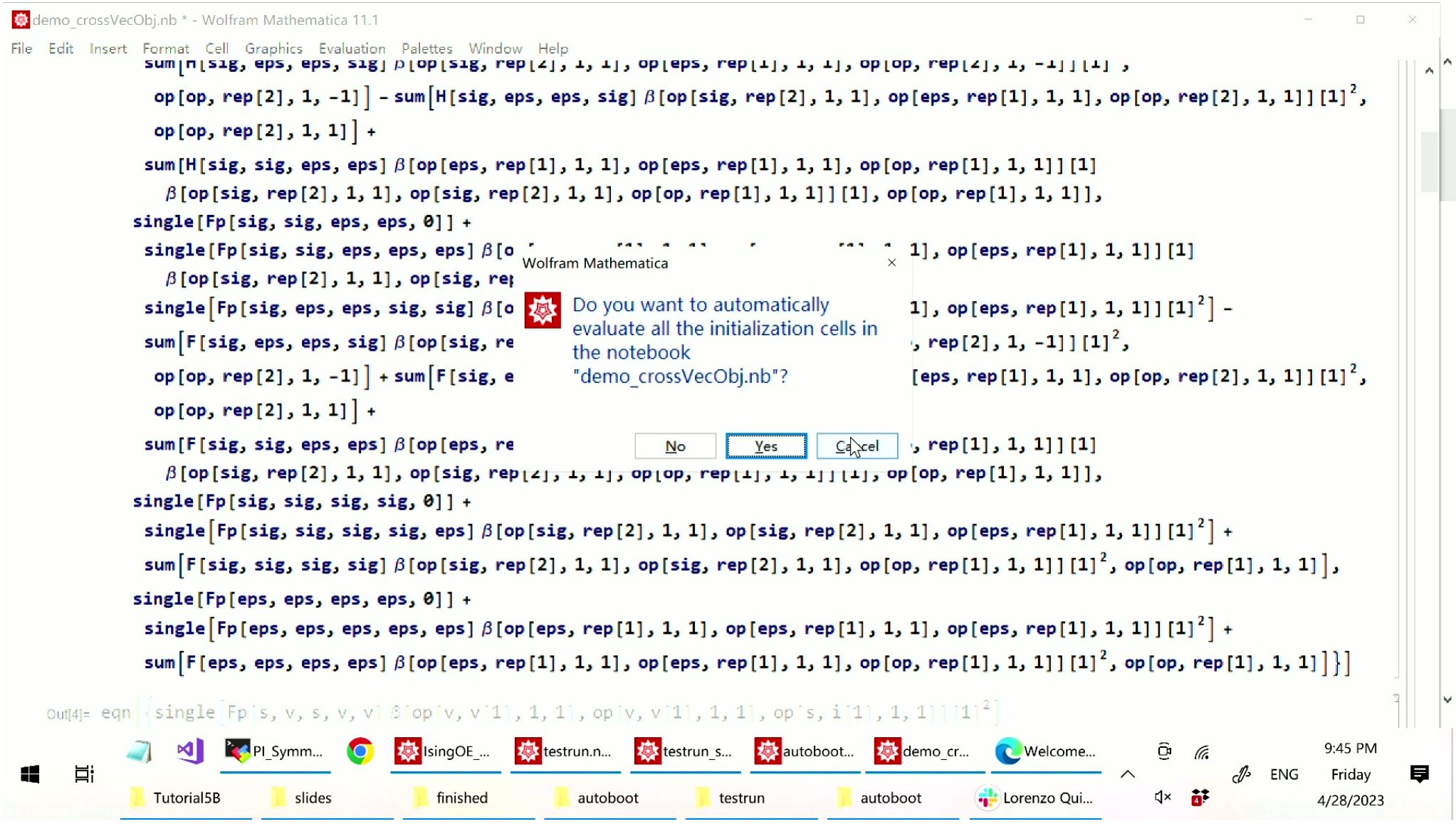
```
AutoEqu$EquToCrossVecObj[eq, {sig, eps}, "AutoEqu_Ising_OE.txt"];

crossvecobj = Import["AutoEqu_Ising_OE.txt", "Package"]

eq = Import["autoboot_Ising_OEE.txt", "Package"];

AutoEqu$EquToCrossVecObj[eq, {sig, eps1, eps2}, "AutoEqu_Ising_OEE.txt"];
```

O(3)

v,s,t

```
eq = Import["autoboot_O3_VST.txt", "Package"];
```




demo_crossVecObj.nb * - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
Wolfram Mathematica
Do you want to automatically evaluate all the initialization cells in the notebook "demo_crossVecObj.nb"?
No
Yes
Cancel
Out[4]= eqn
PI_Symm...
IsingOE_...
testrun.n...
testrun_s...
autoboot...
demo_cr...
Welcome...
ENG
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autoboot
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autoboot
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testrun_skydiving.nb * - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
Get["./Scripts/config.m"];
Get[ReconfigCmd@"[Local.PackageDirectory]/Bootstrapper.m"];
Bootstapper packages Loaded. Version : 4.0
MMA Precision set to 200.
In[7]:=
Cluster$SetConfig["[Cluster.ProjectDirectory]","Proj_Tutorial3B_testrun"];
CheckDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]"];
crossing vector
crossvecobj=LoadExpression[""];
block spec
In[10]:=
blockConfObj={"dim"→3,"Λmax"→11,"κ"→12,"rN"→48,"lset"→Range[0,20]~Join~{49,52}};
initialize simpleboot
In[11]:=
AutoCB3$Init[crossvecobj,blockConfObj];
120%
PI_Symm...
IsingOE_...
testrun.n...
testrun_s...
autoboot...
demo_cr...
Welcome...
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AutoEqu
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```
In[15]:= crossvecobj=LoadExpression["AutoEqu_Ising_OE.txt"];

In[17]:= ObjGet[crossvecobj, "VBlock"][[All, 1]]
Out[17]= {op[op, rep[2], 1, -1], op[op, rep[2], 1, 1], op[op, rep[1], 1, 1]}

In[20]:= ObjGet[crossvecobj, "VBlock", op[op, rep[2], 1, -1]] // MatrixForm
Out[20]//MatrixForm=
F[sig, eps, sig, eps]
H[sig, eps, eps, sig]
-F[sig, eps, eps, sig]
0
0
```

block spec

```
In[10]:= blockConfObj={"dim"→3,"Δmax"→11,"x"→12,"rN"→48,"lset"→Range[0,20]~Join~{49,52}};
```

initialize simpleboot

```
In[11]:= AutoCB3$Init[crossvecobj,blockConfObj];
```

SDP template

120%

PI_Symm... IsingOE_... testrun.n... testrun_s... autoboot... demo_cr... Welcome...

testrun slides finished autoboot testrun AutoEqu Lorenzo Qui...

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testrun_skydiving.nb * - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

initialize simpleboot

In[22]:=
```
AutoCB3$Init[crossvecobj,blockConfObj];
```

SDP template

In[23]:=
```
ObjGet[crossvecobj, "VBlock"][[All, 1]]
```

Out[23]=
```
{op[op, rep[2], 1, -1], op[op, rep[2], 1, 1], op[op, rep[1], 1, 1]}
```

```
GapConfiguration[dim_, lset_] := {
   {op[op, rep[1], 1, 1], 3, {0}},
   {op[op, rep[2], 1, 1], 3, {0}},
   {op[op, rep[1], 1, 1], Δunitary[dim, ℓ], Select[lset, EvenQ[#] && # > 0 &]},
   {op[op, "T", 1, 1], Δunitary[dim, ℓ], Select[lset, EvenQ[#] && # ≥ 0 &]},
   {op[op, "A", 1, -1], Δunitary[dim, ℓ], Select[lset, OddQ[#] && # ≥ 0 &]}
  };
```

In[13]:=
```
mySDPTemplate[]:=Module[
{objective,normalization,conditions},
objective=AutoCB3$Vector[CrossVec["zero"]];
normalization=AutoCB3$Vector[CrossVec["identity"]];
```

120%

PI_Symm... IsingOE_... testrun.n... testrun_s... autoboot... demo_cr... Welcome...

testrun slides finished autoboot testrun AutoEqu ! Lorenzo Q...

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testrun_skydiving.nb * - Wolfram Mathematica 11.1

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Out[23]= {op[op, rep[2], 1, -1], op[op, rep[2], 1, 1], op[op, rep[1], 1, 1]}

```
GapConfiguration[dim_,lset_]:={
{op[op,rep[1],1,1],3,{0}},
{op[op,rep[2],1,1],3,{0}},
{op[op,rep[1],1,1],Δunitary[dim,ℓ],Select[lset,EvenQ[#]&&#>0&]},
{op[op,rep[2],1,1],Δunitary[dim,ℓ],Select[lset,EvenQ[#]&&#>0&]},
{op[op,rep[2],1,-1],Δunitary[dim,ℓ],Select[lset,OddQ[#]&&#≥0&]}
};
```

In[13]:=
```
mySDPTemplate[] := Module[
   {objective, normalization, conditions},
   objective = AutoCB3$Vector[CrossVec["zero"]];
   normalization = AutoCB3$Vector[CrossVec["identity"]];

   conditions = AutoCB3$Condition[GapConfiguration];

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

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

```
{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0}
```

120%

PI_Symm... IsingOE_... testrun.n... testrun_s... autoboot... demo_cr... Welcome...

testrun slides finished autoboot testrun AutoEqu ! Lorenzo Q...

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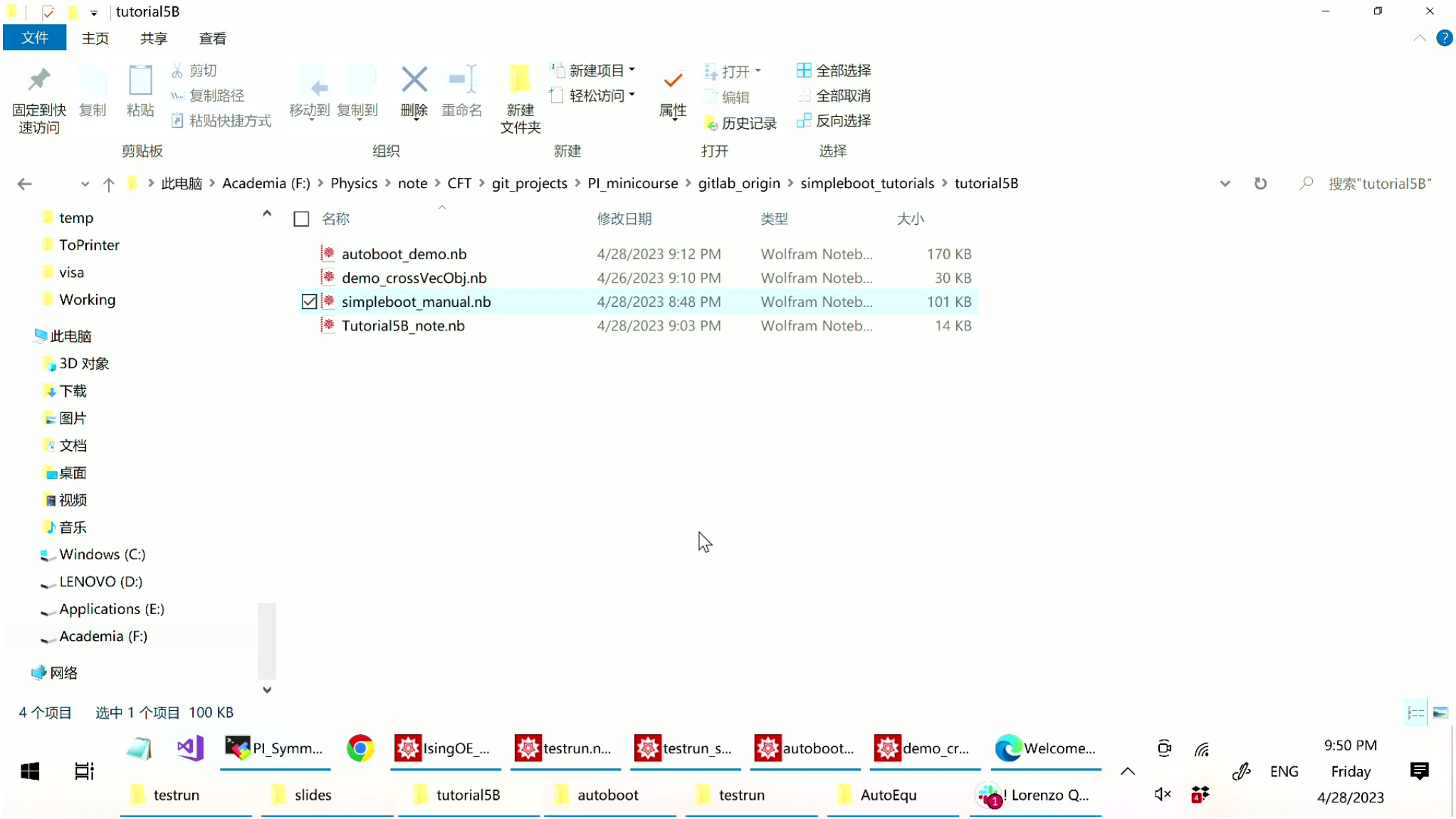
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固定到快速访问
复制
粘贴
剪切
复制路径
粘贴快捷方式
移动到
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删除
重命名
新建文件夹
新建项目
轻松访问
属性
打开
编辑
历史记录
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此电脑 › Academia (F:) › Physics › note › CFT › git_projects › PI_minicourse › gitlab_origin › simpleboot_tutorials › tutorial5B
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autoboot_demo.nb 4/28/2023 9:12 PM Wolfram Noteb... 170 KB
demo_crossVecObj.nb 4/26/2023 9:10 PM Wolfram Noteb... 30 KB
simpleboot_manual.nb 4/28/2023 8:48 PM Wolfram Noteb... 101 KB
Tutorial5B_note.nb 4/28/2023 9:03 PM Wolfram Noteb... 14 KB
4 个项目 选中 1 个项目 100 KB
PI_Symm...
IsingOE_...
testrun.n...
testrun_s...
autoboot...
demo_cr...
Welcome...
testrun
slides
tutorial5B
autoboot
testrun
AutoEqu
! Lorenzo Q...
ENG
9:50 PM
Friday
4/28/2023

testrun_skydiving.nb * - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
{{0, 1/2 P[FSsigsigepseps, 0, 2, 0,
    2.00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000]},
 {1/2 P[FSsigsigepseps, 0, 2, 0,
    2.00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000], 0}},
{{0, 1/2 P[FSsigsigepseps, 0, 2, 2,
    2.00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000]},
 {1/2 P[FSsigsigepseps, 0, 2, 2,
    2.00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000], 0}},
{{0, 1/2 P[FSsigsigepseps, 0, 3, 1,
    2.00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000]},
 {1/2 P[FSsigsigepseps, 0, 3, 1,
    2.00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
```

120%

testrun_skydiving.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
AutoCB3$Condition[GapConfiguration];

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

In[28]:=
```
mySDPTemplate[]
```

Generate a SDP

In[29]:=
```
SDP$Ising$OE[point_,filename_:Automatic]:=Module[
{Δσ,Δε},
{Δσ,Δε}=point//SetPrec$Real;

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

call the scanner

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

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

120%

PI_Symm... IsingOE_... testrun.n... testrun_s... autoboot... demo_cr... simplebo...
Welcome ... testrun slides tutorial5B autoboot testrun AutoEqu Lorenzo ...
ENG 9:54 PM Friday 4/28/2023

testrun_skydiving.nb * - Wolfram Mathematica 11.1

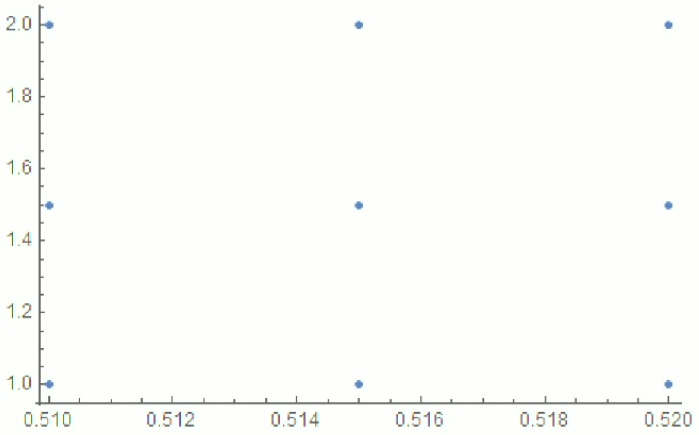
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

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

call the scanner

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

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




```
SSH$UploadCurrentNotebook[]
```

120%

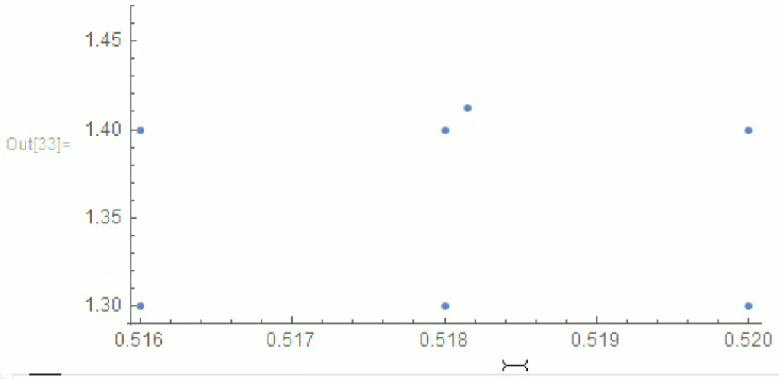
PI_Sym... IsingOE... testrun.... testrun... autobo... demo_c... simple... Tutorial...

Welcome ... testrun slides tutorial5B autoboot testrun AutoEqu Lorenzo ...

ENG 9:55 PM Friday 4/28/2023

testrun_skydiving.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help




```
SSH$UploadCurrentNotebook[]


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 *)
```

120%

PI_Sym... IsingOE... testrun.... testrun... autobo... demo_c... simple... Tutorial...
Welcome ... testrun slides tutorial5B autoboot testrun AutoEqu Lorenzo ...
ENG 9:56 PM Friday 4/28/2023

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

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
Cluster$SetConfig["[Cluster.ProjectDirectory]","Proj_Tutorial5B_testrun_skydiving_fresh"];
CheckDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]"];
```

crossing vector

In[15]:=
```
crossvecobj=LoadExpression["AutoEqu_Ising_OE.txt"];
```

In[17]:=
```
ObjGet[crossvecobj, "VBlock"][[All, 1]]
```

Out[17]=
```
{op[op, rep[2], 1, -1], op[op, rep[2], 1, 1], op[op, rep[1], 1, 1]}
```

In[20]:=
```
ObjGet[crossvecobj, "VBlock", op[op, rep[2], 1, -1]] // MatrixForm
```

Out[20]//MatrixForm=

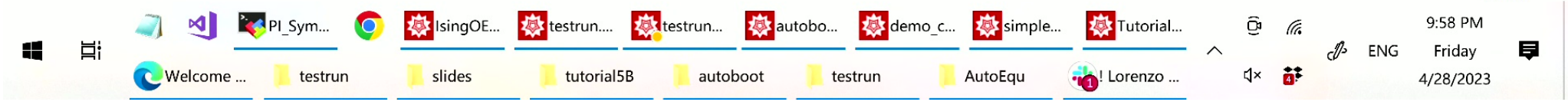
$$\begin{pmatrix} F[sig, eps, sig, eps] \\ H[sig, eps, eps, sig] \\ -F[sig, eps, eps, sig] \\ 0 \\ 0 \end{pmatrix}$$

In[25]:=
```
ObjGet[crossvecobj, "VBlock$Single"] // MatrixForm
```

Out[25]//MatrixForm=

$$\begin{pmatrix} \begin{pmatrix} Fp[sig, eps, sig, eps, sig] & 0 \\ 0 & 0 \end{pmatrix} \\ \begin{pmatrix} -Hp[sig, eps, eps, sig, sig] & \frac{1}{2} Hp[sig, sig, eps, eps, eps] \\ \frac{1}{2} Hp[sig, sig, eps, eps, eps] & 0 \end{pmatrix} \end{pmatrix}$$

120%



testrun_skydiving.nb * - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
SetDirectory@GetFileDirectory[];

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

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

In[7]:=
```
Cluster$SetConfig["[Cluster.ProjectDirectory]","Proj_Tutorial5B_testrun_skydiving_fresh"];
CheckDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]"];
```

crossing vector

In[9]:=
```
crossvecobj=LoadExpression["AutoEqu_Ising_OE.txt"];
```

In[17]:=
```
ObjGet[crossvecobj, "VBlock"][[All, 1]]
```

Out[17]=
```
{op[op, rep[2], 1, -1], op[op, rep[2], 1, 1], op[op, rep[1], 1, 1]}
```

In[20]:=
```
ObjGet[crossvecobj, "VBlock", op[op, rep[2], 1, -1]] // MatrixForm
```

Out[20]//MatrixForm=

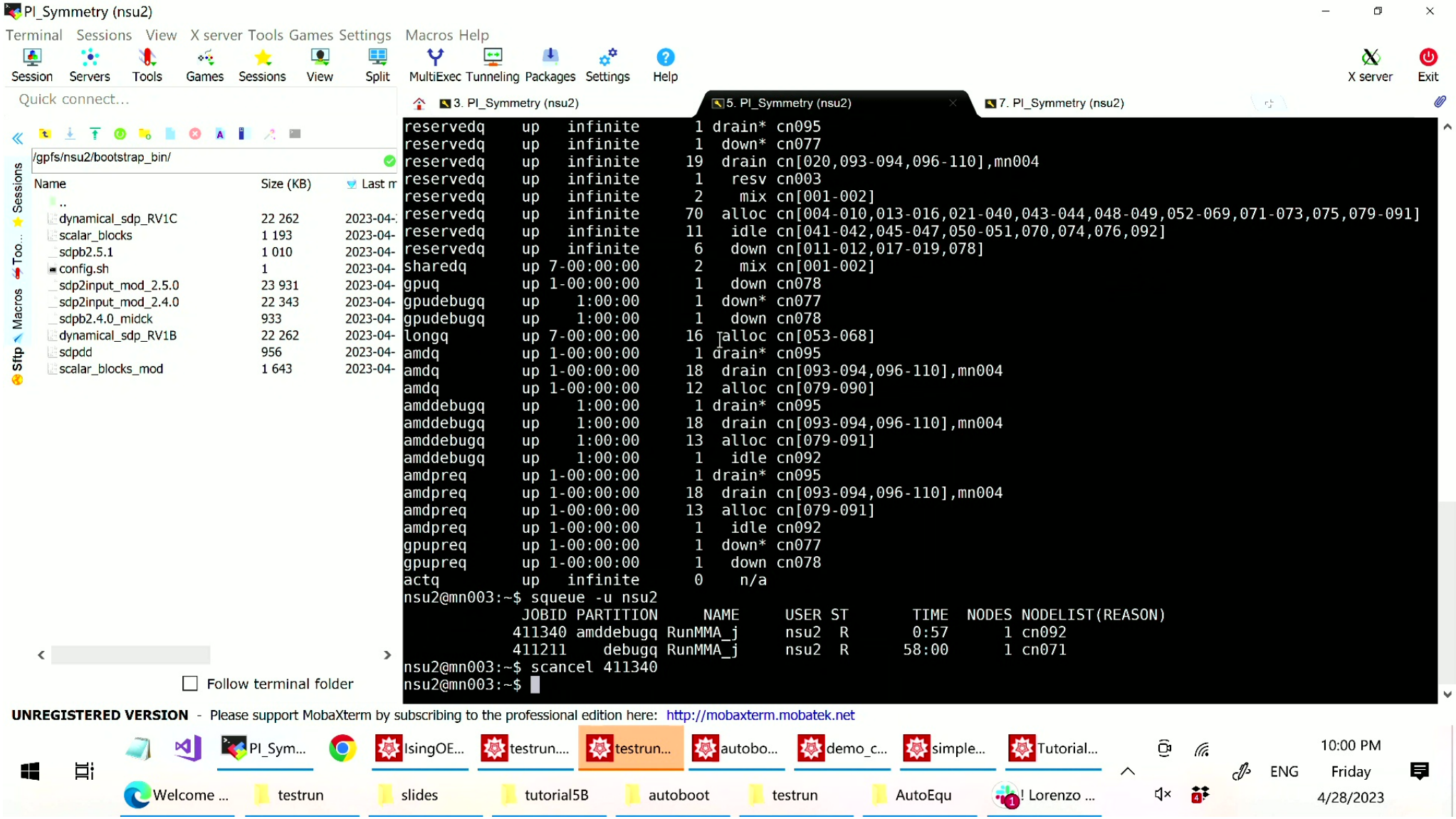
$$\begin{pmatrix} F[sig, eps, sig, eps] \\ H[sig, eps, eps, sig] \\ -F[sig, eps, eps, sig] \\ 0 \end{pmatrix}$$

120%

PI_Sym... IsingOE... testrun.... testrun... autobo... demo_c... simple... Tutorial...

Welcome ... testrun slides tutorial5B autoboot testrun AutoEqu Lorenzo ...

ENG 9:59 PM Friday 4/28/2023


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...
3. PI_Symmetry (nsu2)
5. PI_Symmetry (nsu2)
7. PI_Symmetry (nsu2)
/gpfs/nsu2/bootstrap_bin/
Name Size (KB) Last m
dynamical_sdp_RV1C 22 262 2023-04-
scalar_blocks 1 193 2023-04-
sdpb2.5.1 1 010 2023-04-
config.sh 1 2023-04-
sdp2input_mod_2.5.0 23 931 2023-04-
sdp2input_mod_2.4.0 22 343 2023-04-
sdpb2.4.0_midck 933 2023-04-
dynamical_sdp_RV1B 22 262 2023-04-
sdpdd 956 2023-04-
scalar_blocks_mod 1 643 2023-04-
Follow terminal folder
reservedq up infinite 1 drain* cn095
reservedq up infinite 1 down* cn077
reservedq up infinite 19 drain cn[020,093-094,096-110],mn004
reservedq up infinite 1 resv cn003
reservedq up infinite 2 mix cn[001-002]
reservedq up infinite 70 alloc cn[004-010,013-016,021-040,043-044,048-049,052-069,071-073,075,079-091]
reservedq up infinite 11 idle cn[041-042,045-047,050-051,070,074,076,092]
reservedq up infinite 6 down cn[011-012,017-019,078]
sharedq up 7-00:00:00 2 mix cn[001-002]
gpuq up 1-00:00:00 1 down cn078
gpudebugq up 1:00:00 1 down* cn077
gpudebugq up 1:00:00 1 down cn078
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 13 alloc cn[079-091]
amddebugq up 1:00:00 1 idle cn092
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 13 alloc cn[079-091]
amdpreq up 1-00:00:00 1 idle cn092
gpupreq up 1-00:00:00 1 down* cn077
gpupreq up 1-00:00:00 1 down cn078
actq up infinite 0 n/a
nsu2@mn003:~$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
411340 amddebugq RunMMA_j nsu2 R 0:57 1 cn092
411211 debugq RunMMA_j nsu2 R 58:00 1 cn071
nsu2@mn003:~$ scancel 411340
nsu2@mn003:~$
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ENG
10:00 PM
Friday
4/28/2023

testrun_skydiving.nb * - Wolfram Mathematica 11.1

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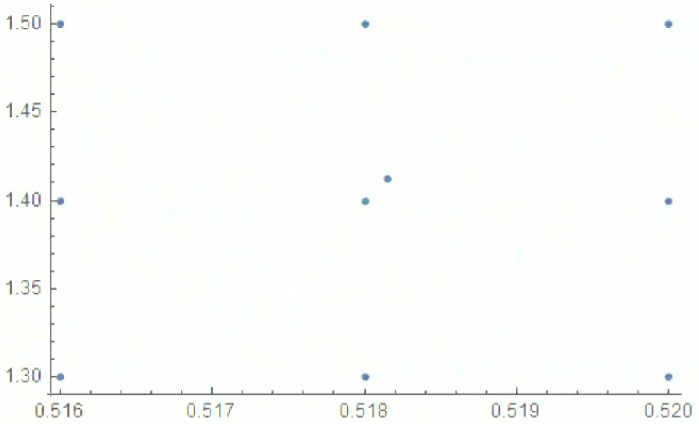
```
ListPlot[initpts]
```

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

Out[33]=



In[15]:=
```
SSH$UploadCurrentNotebook[]
```

Out[15]=

In[16]:=
```
ClusterAsyn$Evaluate[
 AutoCB3$SaveSDPTemplate@mySDPTemplate[];
 initpts = {{0.5181489, 1.412625}} ~ Join ~ GeneratePointsInRectangular[{0.516, 0.52}, {1.3, 1.5}, 3, 3];
 SB$FeasibilityScanner[
  SDP$Ising$OE, (* function that generates a SDP *)
  initpts, (* initial points to scan *)
```

120%

PI_Sym... IsingOE... testrun.... testrun... autobo... demo_c... simple... Tutorial...

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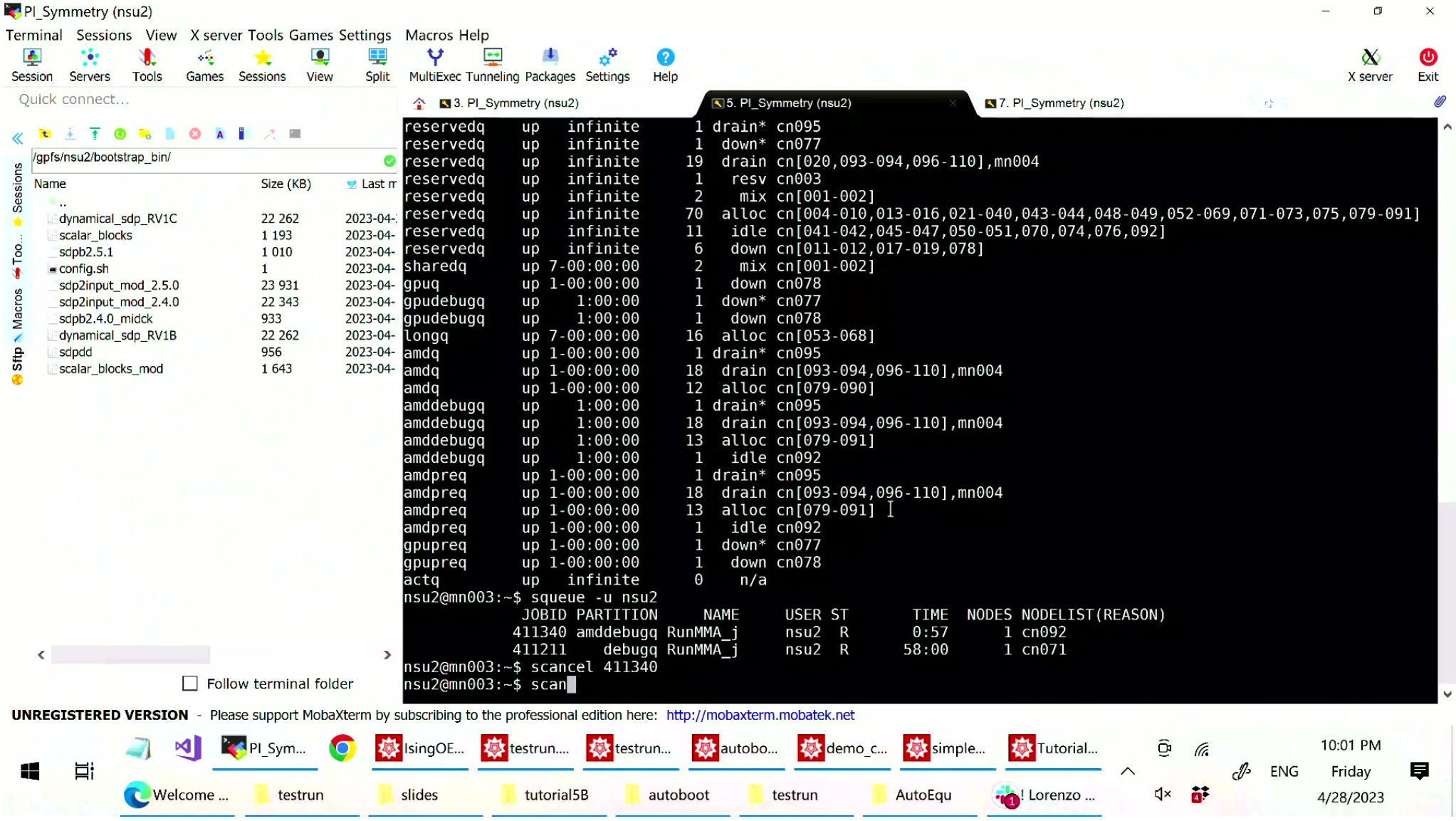
PI_Symmetry (nsu2)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help X server Exit
Quick connect...
3. PI_Symmetry (nsu2)
5. PI_Symmetry (nsu2)
7. PI_Symmetry (nsu2)
/gpfs/nsu2/bootstrap_bin/
Name Size (KB) Last m
dynamical_sdp_RV1C 22 262 2023-04-
scalar_blocks 1 193 2023-04-
sdpb2.5.1 1 010 2023-04-
config.sh 1 2023-04-
sdp2input_mod_2.5.0 23 931 2023-04-
sdp2input_mod_2.4.0 22 343 2023-04-
sdpb2.4.0_midck 933 2023-04-
dynamical_sdp_RV1B 22 262 2023-04-
sdpdd 956 2023-04-
scalar_blocks_mod 1 643 2023-04-
Follow terminal folder
reservedq up infinite 1 drain* cn095
reservedq up infinite 1 down* cn077
reservedq up infinite 19 drain cn[020,093-094,096-110],mn004
reservedq up infinite 1 resv cn003
reservedq up infinite 2 mix cn[001-002]
reservedq up infinite 70 alloc cn[004-010,013-016,021-040,043-044,048-049,052-069,071-073,075,079-091]
reservedq up infinite 11 idle cn[041-042,045-047,050-051,070,074,076,092]
reservedq up infinite 6 down cn[011-012,017-019,078]
sharedq up 7-00:00:00 2 mix cn[001-002]
gpuq up 1-00:00:00 1 down cn078
gpudebugq up 1:00:00 1 down* cn077
gpudebugq up 1:00:00 1 down cn078
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 13 alloc cn[079-091]
amddebugq up 1:00:00 1 idle cn092
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 13 alloc cn[079-091]
amdpreq up 1-00:00:00 1 idle cn092
gpupreq up 1-00:00:00 1 down* cn077
gpupreq up 1-00:00:00 1 down cn078
actq up infinite 0 n/a
nsu2@mn003:~$ squeue -u nsu2
JOBID PARTITION NAME USER ST TIME NODES NODELIST(REASON)
411340 amddebugq RunMMA_j nsu2 R 0:57 1 cn092
411211 debugq RunMMA_j nsu2 R 58:00 1 cn071
nsu2@mn003:~$ scancel 411340
nsu2@mn003:~$ scan
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PI_Sym... IsingOE... testrun.... testrun... autobo... demo_c... simple... Tutorial...
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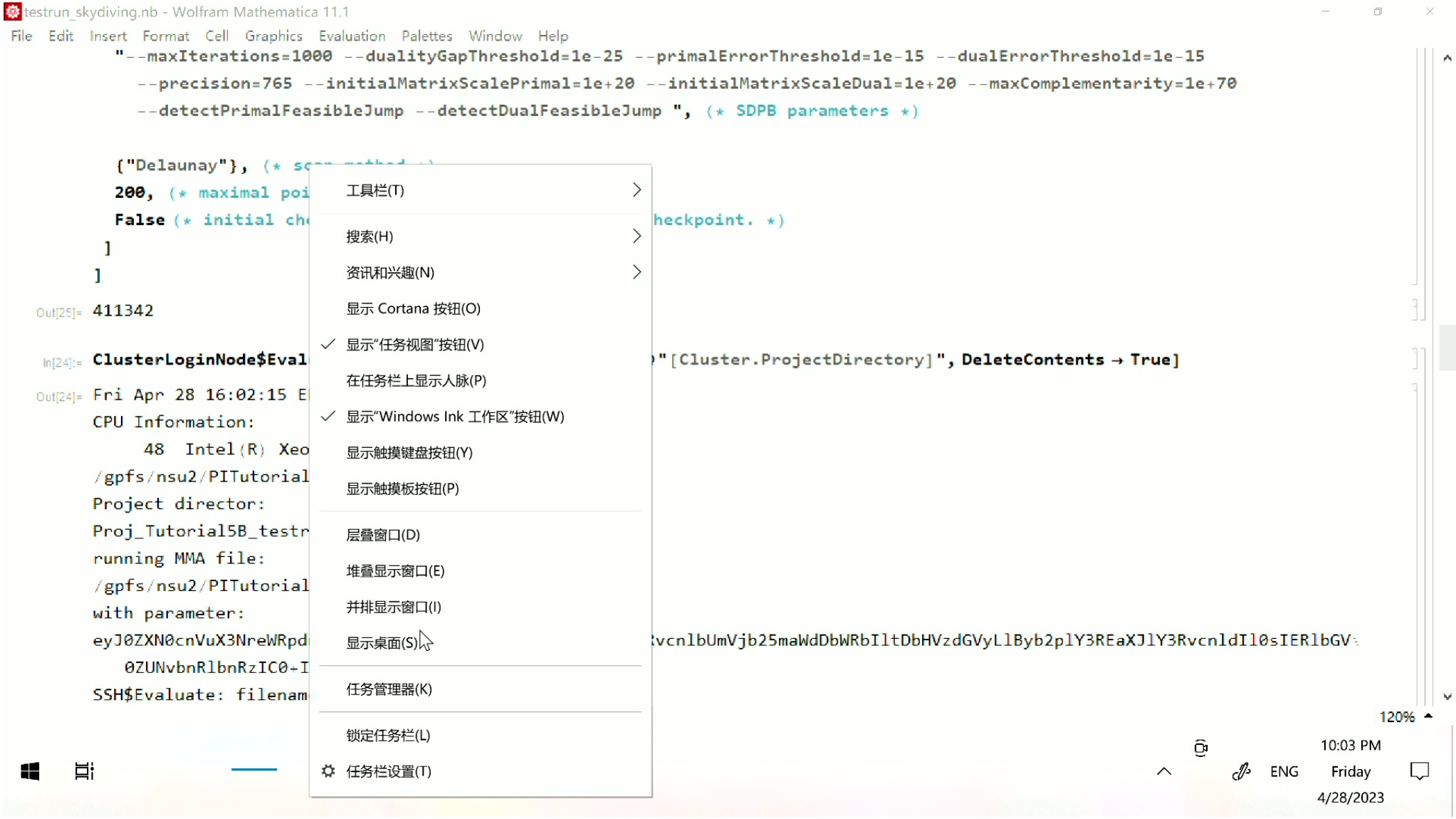
4/28/2023


testrun_skydiving.nb - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
"--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 poi
False (* initial ch
heckpoint. *)
]
]
Out[25]= 411342
In[24]:= ClusterLoginNode$Eval
"[Cluster.ProjectDirectory]", DeleteContents → True]
Out[24]= Fri Apr 28 16:02:15 E
CPU Information:
48 Intel(R) Xeo
/gpfs/nsu2/PITutorial
Project director:
Proj_Tutorial5B_testr
running MMA file:
/gpfs/nsu2/PITutorial
with parameter:
eyJ0ZXN0cnVuX3NreWRpd
tvcnlbUmVjb25maWdDbWRbIltDbHVzdGVyLlByb2plY3REaXJlY3RvcnldIl0sIERlbGV
0ZUNvbnRlbnRzIC0tI
SSH$Evaluate: filenam
工具栏(T)
搜索(H)
资讯和兴趣(N)
显示 Cortana 按钮(O)
显示"任务视图"按钮(V)
在任务栏上显示人脉(P)
显示"Windows Ink 工作区"按钮(W)
显示触摸键盘按钮(Y)
显示触摸板按钮(P)
层叠窗口(D)
堆叠显示窗口(E)
并排显示窗口(I)
显示桌面(S)
任务管理器(K)
锁定任务栏(L)
任务栏设置(T)
120%
10:03 PM
ENG
Friday
4/28/2023

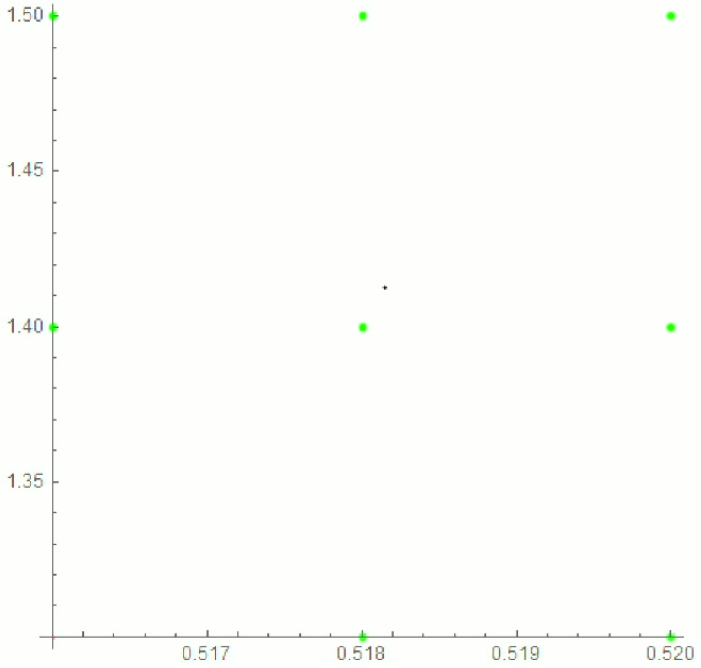
testrun_skydiving.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
SB$LoadProject[];
```

Out[28]=

In[28]:=
```
SB$DelaunayPlot[]
```



Out[28]=

```
ObjGet[SB$Proj, "calculated", All, "DeltaList"]
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

autoboot_dem... IsingOE_nvg.nb... Solstice Lorenzo Quinta... Welcome to the... testrun

ENG 10:04 PM Friday 4/28/2023

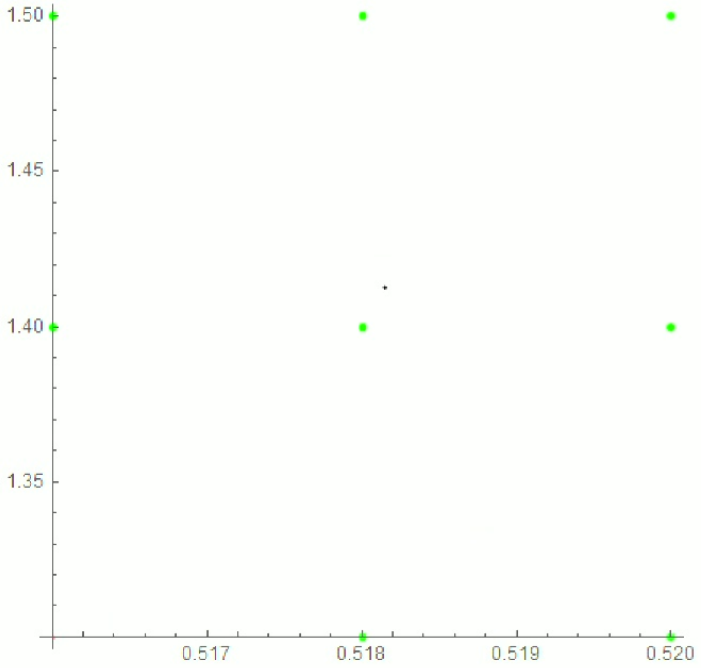
testrun_skydiving.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
SB$LoadProject[];
```

Out[28]=

In[28]:=
```
SB$DelaunayPlot[]
```



Out[28]=

```
ObjGet[SB$Proj, "calculated", All, "DeltaList"]
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

autoboot_dem... IsingOE_nvg.nb... Solstice Lorenzo Quinta... Welcome to the... testrun

ENG 10:04 PM Friday 4/28/2023

testrun_skydiving_actual.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
SDP$Ising$OE[point_,filename_:Automatic]:=Module[
{Δσ,Δε},
{Δσ,Δε}=point//SetPrec$Real;

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

package config

call the scanner

```
initpts = {{0.5181489, 1.412625}} ~Join~ GeneratePointsInRectangular[{0.516, 0.52}, {1.3, 1.5}, 3, 3];
ListPlot[initpts]
```

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

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...
autoboot_de... IsingOE_nvg... testrun_skyd... Solstice Lorenzo Qui... Welcome to... Scripts
ENG 10:07 PM Friday 4/28/2023

testrun_skydiving_actual.nb * - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
(* 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_Tutorial5B_testrun_skydiving_fresh_actual"];
CheckDirectory[ReconfigCmd@"[Cluster.ProjectDirectory]"];
```

crossing vector

```
crossvecobj=LoadExpression["AutoEqu_Ising_OE.txt"];
```

```
SSH$UploadFile["AutoEqu_Ising_OE.txt"]
```

```
ObjGet[crossvecobj, "VBlock"][[All, 1]]
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

autoboot_de... IsingOE_nvg... testrun_skyd... Solstice Lorenzo Qui... Welcome to... Scripts

ENG 10:08 PM Friday 4/28/2023

testrun_skydiving_actual.nb * - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
Cluster$SetConfig["[AutoCB3.FixPrefactor]",True];
```

call the scanner

```
SB$SkydivingRun[
 DynamicSDPB$Options, (* options managed by simpleboot *)
 DynamicSDPB$GenerateAllSDP[SDPGenerator], (* SDP generator *)
 initpt, (* initial point *)
 "--procsPerNode $phys_cores_per_node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
   3600 --maxRuntime 72000 --dualityGapThreshold 1.0e-30 --primalErrorThreshold 1.0e-15 --dualErrorThreshold
   1.0e-15 --initialMatrixScalePrimal 1.0e20 --initialMatrixScaleDual 1.0e20 --feasibleCenteringParameter
   0.3 --infeasibleCenteringParameter 0.3 --stepLengthReduction 0.7 --maxComplementarity 1.0e100 --maxIterations
   1000 --verbosity 1 --procGranularity 1 --totalIterationCount=0 --findBoundaryObjThreshold 1.0e-20
   --maxClimbingSteps 1 --betaClimbing 1.5 --betaScanMin=0.3 --betaScanMax=1.01 --betaScanStep=0.1
   --stepMinThreshold=0.1 --stepMaxThreshold=0.6 --primalDualObjWeight=0.2 --navigatorWithLogDetX=False
   --gradientWithLogDetX=True ",  (* skydiving options *)
 1000, (* max number of steps *)
 False (* initial checkpoint *)
]
```

call the scanner

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

autoboot_de... IsingOE_nvg... testrun_skyd... Solstice Lorenzo Qui... Welcome to... Scripts

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testrun_skydiving_actual.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
Cluster$SetConfig["[AutoCB3.FixPrefactor]",True];
```

call the scanner

```
DynamicSDPB$Options = {
   "DynamicSDPB.Infinitesimal" → 10^-40,
   "DynamicSDPB.ExtParamDim" → 2,

   "DynamicSDPB.DualityGapUpperLimit" → Automatic[10^-4],
   (* 10^-4 or Automatic[10^-4]. The latter only sets the limit on the 1st SDP *)

   "DynamicSDPB.FindBoundary" → {1, 0}, (* {x1,x2, ...} or False *)
   "DynamicSDPB.InitHessian" → Automatic, (* Choices : Identity, Automatic, an actual matrix *)

   "DynamicSDPB.InitSDPBReturn" → False
  };

SB$SkydivingRun[
 DynamicSDPB$Options, (* options managed by simpleboot *)
 DynamicSDPB$GenerateA11SDP[SDPGenerator], (* SDP generator *)
 initpt, (* initial point *)
 "--procsPerNode $phys cores per node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
```

120%

testrun_skydiving_actual.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
Cluster$SetConfig["[AutoCB3.FixPrefactor]",True];
```

call the scanner

```
DynamicSDPB$Options = {
   "DynamicSDPB.Infinitesimal" → 10^-40,
   "DynamicSDPB.ExtParamDim" → 2,

   "DynamicSDPB.DualityGapUpperLimit" → Automatic[10^-4],
   (* 10^-4 or Automatic[10^-4]. The latter only sets the limit on the 1st SDP *)

   "DynamicSDPB.FindBoundary" → {1, 0}, (* {x1,x2, ...} or False *)
   "DynamicSDPB.InitHessian" → Automatic,  (* Choices : Identity, Automatic, an actual matrix *)

   "DynamicSDPB.InitSDPBReturn" → False
  };

SB$SkydivingRun[
 DynamicSDPB$Options, (* options managed by simpleboot *)
 DynamicSDPB$GenerateAllSDP[SDPGenerator], (* SDP generator *)
 initpt, (* initial point *)
 "--procsPerNode $phys cores per node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
```

120%

testrun_skydiving_actual.nb - Wolfram Mathematica 11.1

File Edit Insert Format Cell Graphics Evaluation Palettes Window Help

```
 "DynamicSDPB.DualityGapUpperLimit"→Automatic[10^-4],  (* 10^-4 or Automatic[10^-4]. The latter only sets the limit on the 1st SDP *)

 "DynamicSDPB.FindBoundary"→{1,0}, (* {x1,x2, ...} or False *)
 "DynamicSDPB.InitHessian"→Automatic,  (* Choices : Identity, Automatic, an actual matrix *)

 "DynamicSDPB.InitSDPBReturn"→False
 };

SB$SkydivingRun[
 DynamicSDPB$Options, (* options managed by simpleboot *)
 DynamicSDPB$GenerateAllSDP[SDP$Ising$OE], (* SDP generator *)
 initpt, (* initial point *)
 "--procsPerNode $phys_cores_per_node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
   3600 --maxRuntime 72000 --dualityGapThreshold 1.0e-30 --primalErrorThreshold 1.0e-15 --dualErrorThreshold
   1.0e-15 --initialMatrixScalePrimal 1.0e20 --initialMatrixScaleDual 1.0e20 --feasibleCenteringParameter
   0.3 --infeasibleCenteringParameter 0.3 --stepLengthReduction 0.7 --maxComplementarity 1.0e100 --maxIterations
   1000 --verbosity 1 --procGranularity 1 --totalIterationCount=0 --findBoundaryObjThreshold 1.0e-20
   --maxClimbingSteps 1 --betaClimbing 1.5 --betaScanMin=0.3 --betaScanMax=1.01 --betaScanStep=0.1
   --stepMinThreshold=0.1 --stepMaxThreshold=0.6 --primalDualObjWeight=0.2 --navigatorWithLogDetX=False
   --gradientWithLogDetX=True ",  (* skydiving options *)
 1000, (* max number of steps *)
 False (* initial checkpoint *)
]
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

autoboot_de... IsingOE_nvg... testrun_skyd... Solstice Lorenzo Qui... Welcome to... Scripts

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testrun_skydiving_actual.nb - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
Get[ReconfigCmd@"[Local.PackageDirectory]/Skydiving_v3.2.m"];
Cluster$SetConfig["[AutoCB3.FixPrefactor]",True];
Cluster$SetConfig["[AutoCB3.scalar_blocks_mod.script]",
"mpirun --bind-to none --host [Cluster.Node] -n 1 /home/nsu2/packages/scalarblocks_sdp2input_mod/scalar_blocks_bin/bin/scalar_blocks_mod --num-t
Cluster$SetConfig["[AutoCB3.sdp2input_mod.script]",
"mpirun -n 40 --bind-to none --host [Cluster.Node] /home/nsu2/packages/install/sdp2input_experimental/bin/sdp2input_mod "];
call the scanner
DynamicSDPB$Options={
"DynamicSDPB.Infinitesimal"→10^-40,
"DynamicSDPB.ExtParamDim"→2,
"DynamicSDPB.DualityGapUpperLimit"→Automatic[10^-4], (* 10^-4 or Automatic[10^-4]. The latter only sets the limit on the 1st SDP *)
"DynamicSDPB.FindBoundary"→{1,0}, (* {x1,x2, ...} or False *)
"DynamicSDPB.InitHessian"→Automatic, (* Choices : Identity, Automatic, an actual matrix *)
120%
PI_Symmetr...
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testrun_skydiving_actual.nb - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
Get[ReconfigCmd@"[Local.PackageDirectory]/Skydiving_v3.2.m"];
Cluster$SetConfig["[AutoCB3.FixPrefactor]",True];
Cluster$SetConfig["[AutoCB3.scalar_blocks_mod.script]",
"mpirun --bind-to none --host [Cluster.Node] -n 1 /home/nsu2/packages/scalarblocks_sdp2input_mod/scalar_blocks_bin/bin/scalar_blocks_mod --num-t
Cluster$SetConfig["[AutoCB3.sdp2input_mod.script]",
"mpirun -n 40 --bind-to none --host [Cluster.Node] /home/nsu2/packages/install/sdp2input_experimental/bin/sdp2input_mod "];
DynamicSDPB$GenerateSDP$scalarblocks$ProcessPerNode=9;
DynamicSDPB$GenerateSDP$sdp2input$ProcessPerNode=1;
call the scanner
DynamicSDPB$Options={
"DynamicSDPB.Infinitesimal"→10^-40,
"DynamicSDPB.ExtParamDim"→2,
120%
PI_Symmetr...
testrun_sky...
demo_cross...
simpleboot_...
Tutorial5B_n...
testrun.nb - ...
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testrun_skydiving_actual.nb - Wolfram Mathematica 11.1

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```
 "DynamicSDPB.FindBoundary"→{1,0}, (* {x1,x2, ...} or False *)
 "DynamicSDPB.InitHessian"→Automatic,  (* Choices : Identity, Automatic, an actual matrix *)

 "DynamicSDPB.InitSDPBReturn"→False
 };

SB$SkydivingRun[
 DynamicSDPB$Options, (* options managed by simpleboot *)
 DynamicSDPB$GenerateAllSDP[SDP$Ising$OE], (* SDP generator *)
 initpt, (* initial point *)
 "--procsPerNode $phys_cores_per_node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
   3600 --maxRuntime 72000 --dualityGapThreshold 1.0e-30 --primalErrorThreshold 1.0e-15 --dualErrorThreshold
   1.0e-15 --initialMatrixScalePrimal 1.0e20 --initialMatrixScaleDual 1.0e20 --feasibleCenteringParameter
   0.3 --infeasibleCenteringParameter 0.3 --stepLengthReduction 0.7 --maxComplementarity 1.0e100 --maxIterations
   1000 --verbosity 1 --procGranularity 1 --totalIterationCount=0 --findBoundaryObjThreshold 1.0e-20
   --maxClimbingSteps 1 --betaClimbing 1.5 --betaScanMin=0.3 --betaScanMax=1.01 --betaScanStep=0.1
   --stepMinThreshold=0.1 --stepMaxThreshold=0.6 --primalDualObjWeight=0.2 --navigatorWithLogDetX=False
   --gradientWithLogDetX=True ",  (* skydiving options *)
 1000, (* max number of steps *)
 False (* initial checkpoint *)
]
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

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In[18]:=

```
Cluster$SetConfig["[DynamicSDPB.script]","mpirun -n $phys_cores_per_node /home/nsu2/packages/dynamical_navigator_merged_RV1C/bin/dynamical_sdp_R
```

```
Get[ReconfigCmd@"[Local.PackageDirectory]/Skydiving_v3.2.m"];
```

```
Cluster$SetConfig["[AutoCB3.FixPrefactor]",True];
```

```
Cluster$SetConfig["[AutoCB3.scalar_blocks_mod.script]",
"mpirun --bind-to none --host [Cluster.Node] -n 1 /home/nsu2/packages/scalarblocks_sdp2input_mod/scalar_blocks_bin/bin/scalar_blocks_mod --num-t
```

```
Cluster$SetConfig["[AutoCB3.sdp2input_mod.script]",
"mpirun -n 40 --bind-to none --host [Cluster.Node] /home/nsu2/packages/install/sdp2input_experimental/bin/sdp2input_mod "];
```

```
DynamicSDPB$GenerateSDP$scalarblocks$ProcessPerNode=9;
DynamicSDPB$GenerateSDP$sdp2input$ProcessPerNode=1;
```

call the scanner

```
DynamicSDPB$Options={
```

120%

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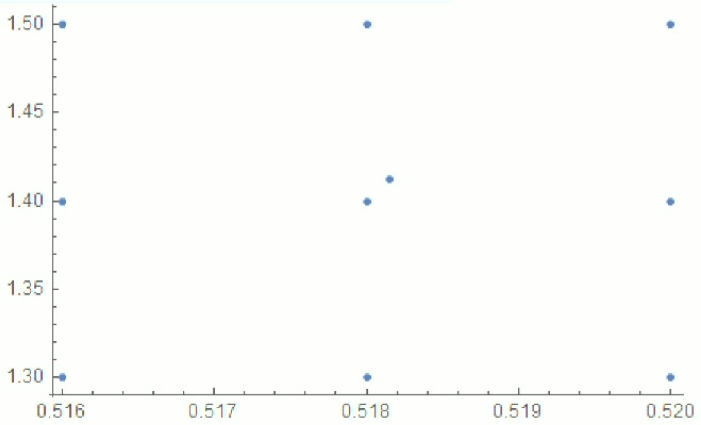
```
};
```

```
ClusterAs
```

ClusterAsyn$Evaluate
ClusterAsyn$EvaluateWaiting
ClusterAsyn$ExecuteBoot
ClusterAsyn$ExecuteMMAScript
ClusterAsyn$ExecuteMMAScriptWithParam

```
} ~Join~ GeneratePointsInRectangular[{0.516, 0.52}, {1.3, 1.5}, 3, 3];
```

n $MinPrecision. Using $MinPrecision instead.




```
SSH$UploadCurrentNotebook[]
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...
autoboot_de... IsingOE_nvg... testrun_skyd... Solstice Lorenzo Qui... Welcome to... Scripts
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testrun_skydiving_actual.nb - Wolfram Mathematica 11.1

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```
SB$SkydivingRun[
 DynamicSDPB$Options, (* options managed by simpleboot *)
 DynamicSDPB$GenerateAllSDP[SDP$Ising$OE], (* SDP generator *)
 initpt, (* initial point *)
 "--procsPerNode $phys_cores_per_node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
   3600 --maxRuntime 72000 --dualityGapThreshold 1.0e-30 --primalErrorThreshold 1.0e-15 --dualErrorThreshold
   1.0e-15 --initialMatrixScalePrimal 1.0e20 --initialMatrixScaleDual 1.0e20 --feasibleCenteringParameter
   0.3 --infeasibleCenteringParameter 0.3 --stepLengthReduction 0.7 --maxComplementarity 1.0e100
   --maxIterations 1000 --verbosity 1 --procGranularity 1 --totalIterationCount=0 --findBoundaryObjThreshold
   1.0e-20 --maxClimbingSteps 1 --betaClimbing 1.5 --betaScanMin=0.3 --betaScanMax=1.01 --betaScanStep=0.1
   --stepMinThreshold=0.1 --stepMaxThreshold=0.6 --primalDualObjWeight=0.2 --navigatorWithLogDetX=False
   --gradientWithLogDetX=True ", (* skydiving options *)
 1000, (* max number of steps *)
 False (* initial checkpoint *)
]
]
```

Out[25]= 411344

```
ClusterAsyn$JobOutput[]
```

call the scanner

```
initpts = {{0.5181489, 1.412625}} ~Join~ GeneratePointsInRectangular[{0.516, 0.52}, {1.3, 1.5}, 3, 3];
```

120%

testrun_skydiving_actual.nb * - Wolfram Mathematica 11.1

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```
 "DynamicSDPB.Infinitesimal"→10^-40,
 "DynamicSDPB.ExtParamDim"→2,

 "DynamicSDPB.DualityGapUpperLimit"→Automatic[10^-4],  (* 10^-4 or Automatic[10^-4]. The latter only sets the limit on the 1st SDP *)

 "DynamicSDPB.FindBoundary"→{1,0}, (* {x1,x2, ...} or False *)
 "DynamicSDPB.InitHessian"→Automatic,  (* Choices : Identity, Automatic, an actual matrix *)

 "DynamicSDPB.InitSDPBReturn"→False
 };
```

In[27]:=
```
SSH$UploadCurrentNotebook[]
```

Out[27]=

```
ClusterAsyn$Evaluate[
 initpt = {0.5181489, 1.412625} // SetPrec;

 SB$SkydivingRun[
  DynamicSDPB$Options, (* options managed by simpleboot *)
  DynamicSDPB$GenerateAllSDP[SDP$Ising$OE], (* SDP generator *)
  initpt, (* initial point *)
  "--procsPerNode $phys_cores_per_node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
    3600 --maxRuntime 72000 --dualityGapThreshold 1.0e-30 --primalErrorThreshold 1.0e-15 --dualErrorThreshold
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

autoboot_de... IsingOE_nvg... testrun_skyd... Solstice Lorenzo Qui... Welcome to... Scripts

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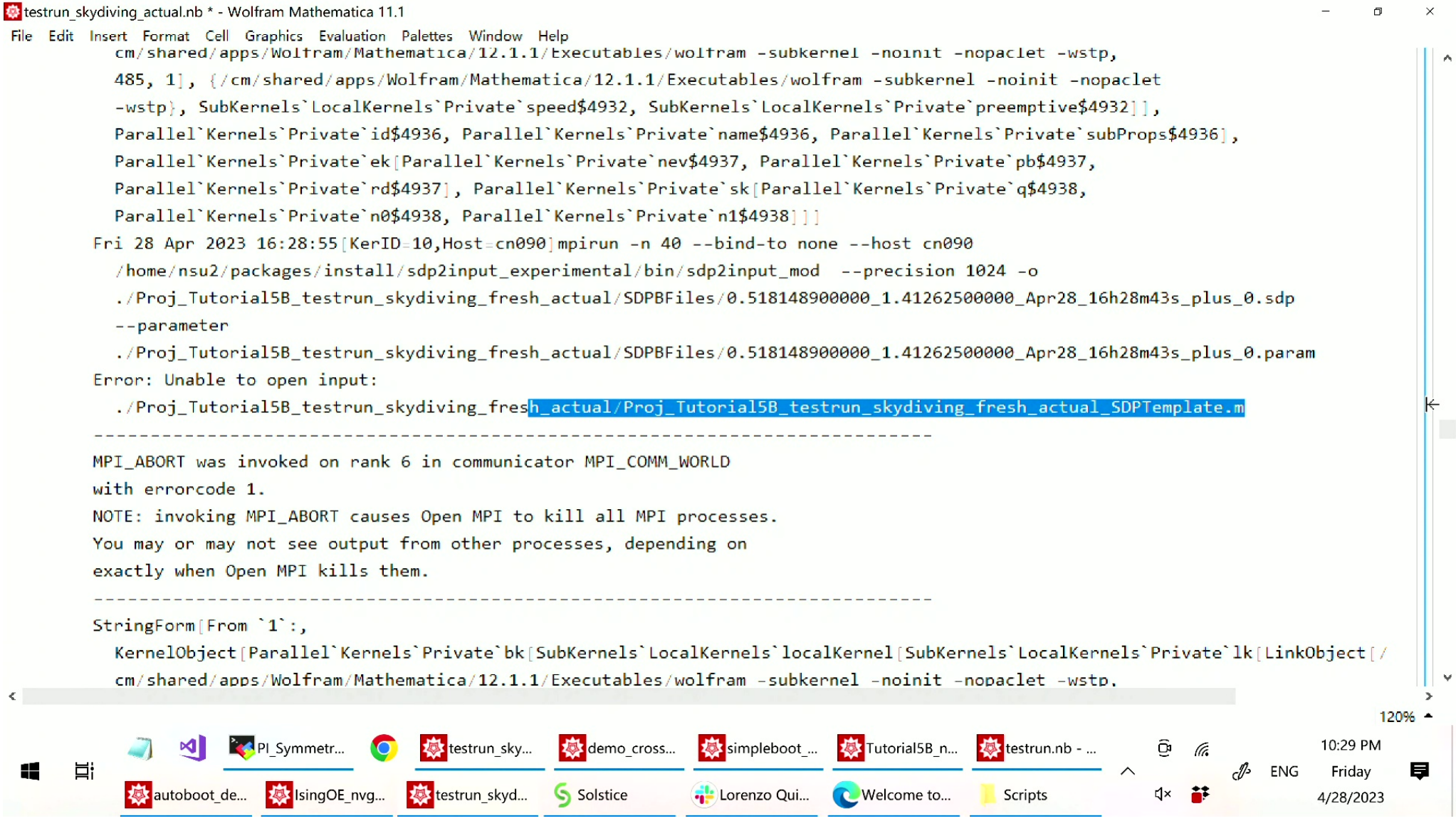
testrun_skydiving_actual.nb * - Wolfram Mathematica 11.1
File Edit Insert Format Cell Graphics Evaluation Palettes Window Help
cm/shared/apps/Wolfram/Mathematica/12.1.1/Executables/wolfram -subkernel -noinit -nopaclet -wstp,
485, 1], {/cm/shared/apps/Wolfram/Mathematica/12.1.1/Executables/wolfram -subkernel -noinit -nopaclet
-wstp}, SubKernels`LocalKernels`Private`speed$4932, SubKernels`LocalKernels`Private`preemptive$4932]],
Parallel`Kernels`Private`id$4936, Parallel`Kernels`Private`name$4936, Parallel`Kernels`Private`subProps$4936],
Parallel`Kernels`Private`ek[Parallel`Kernels`Private`nev$4937, Parallel`Kernels`Private`pb$4937,
Parallel`Kernels`Private`rd$4937], Parallel`Kernels`Private`sk[Parallel`Kernels`Private`q$4938,
Parallel`Kernels`Private`n0$4938, Parallel`Kernels`Private`n1$4938]]]
Fri 28 Apr 2023 16:28:55[KerID=10,Host=cn090]mpirun -n 40 --bind-to none --host cn090
/home/nsu2/packages/install/sdp2input_experimental/bin/sdp2input_mod --precision 1024 -o
./Proj_Tutorial5B_testrun_skydiving_fresh_actual/SDPBFiles/0.518148900000_1.41262500000_Apr28_16h28m43s_plus_0.sdp
--parameter
./Proj_Tutorial5B_testrun_skydiving_fresh_actual/SDPBFiles/0.518148900000_1.41262500000_Apr28_16h28m43s_plus_0.param
Error: Unable to open input:
./Proj_Tutorial5B_testrun_skydiving_fresh_actual/Proj_Tutorial5B_testrun_skydiving_fresh_actual_SDPTemplate.m
----
MPI_ABORT was invoked on rank 6 in communicator MPI_COMM_WORLD
with errorcode 1.
NOTE: invoking MPI_ABORT causes Open MPI to kill all MPI processes.
You may or may not see output from other processes, depending on
exactly when Open MPI kills them.

StringForm[From `1`:,
KernelObject[Parallel`Kernels`Private`bk[SubKernels`LocalKernels`localKernel[SubKernels`LocalKernels`Private`lk[LinkObject[/
cm/shared/apps/Wolfram/Mathematica/12.1.1/Executables/wolfram -subkernel -noinit -nopaclet -wstp,
120%
PI_Symmetr...
testrun_sky...
demo_cross...
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Tutorial5B_n...
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testrun_skydiving_actual.nb * - Wolfram Mathematica 11.1

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```
    DynamicSDPB$Options, (* options managed by simpleboot *)
    DynamicSDPB$GenerateAllSDP[SDP$Ising$OE], (* SDP generator *)
    initpt, (* initial point *)
    "--procsPerNode $phys_cores_per_node --centeringRThreshold=1.0e-10 --precision 768 --checkpointInterval
      3600 --maxRuntime 72000 --dualityGapThreshold 1.0e-30 --primalErrorThreshold 1.0e-15 --dualErrorThreshold
      1.0e-15 --initialMatrixScalePrimal 1.0e20 --initialMatrixScaleDual 1.0e20 --feasibleCenteringParameter
      0.3 --infeasibleCenteringParameter 0.3 --stepLengthReduction 0.7 --maxComplementarity 1.0e100
      --maxIterations 1000 --verbosity 1 --procGranularity 1 --totalIterationCount=0 --findBoundaryObjThreshold
      1.0e-20 --maxClimbingSteps 1 --betaClimbing 1.5 --betaScanMin=0.3 --betaScanMax=1.01 --betaScanStep=0.1
      --stepMinThreshold=0.1 --stepMaxThreshold=0.6 --primalDualObjWeight=0.2 --navigatorWithLogDetX=False
      --gradientWithLogDetX=True ", (* skydiving options *)
    1000, (* max number of steps *)
    False (* initial checkpoint *)
   ]
  ]
```

Out[35]= 411346

In[32]:=
```
ClusterAsyn$JobOutput["411345"]
```

call the scanner

```
initpts = {{0.5181489, 1.412625}} ~Join~ GeneratePointsInRectangular[{0.516, 0.52}, {1.3, 1.5}, 3, 3];
ListPlot[initpts]
```

120%

testrun_skydiving_actual.nb * - Wolfram Mathematica 11.1

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```
[Fri 28 Apr 2023 16:30:59] DeltaScanner : Finished Delta= {0.5181489000000000023347013211605371907353401184082031 25 200.,
  1.41262500000000001953992523340275511145591735839843 75`200.},
  TerminateReason=SDPBResultParser$GetVar[$Failed, terminateReason]
DeltaScanner : Do not find new samplings. Stop.
[RemoteExecuteReturnBegin]TnVsbA==[RemoteExecuteReturnEnd]
SSH$Evaluate result:
Null

In[39]:= ClusterAsyn$SDPBOutput["0.518148900000_1.41262500000_Apr28_16h30m33s.sdp"]

Out[39]= start sdpb_El
Elemental precision = 768
Process 10 caught error message:
option '--totalIterationCount' cannot be specified more than once
Process 11 caught error message:
option '--totalIterationCount' cannot be specified more than once
Process 19 caught error message:
option '--totalIterationCount' cannot be specified more than once
Process 35 caught error message:
option '--totalIterationCount' cannot be specified more than once
Process 40 caught error message:
option '--totalIterationCount' cannot be specified more than once
Process 42 caught error message:
option '--totalIterationCount' cannot be specified more than once
Process 43 caught error message:
```

120%

PI_Symmetr... testrun_sky... demo_cross... simpleboot_... Tutorial5B_n... testrun.nb - ...

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simpleboot_manual.nb - Wolfram Mathematica 11.1

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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}]

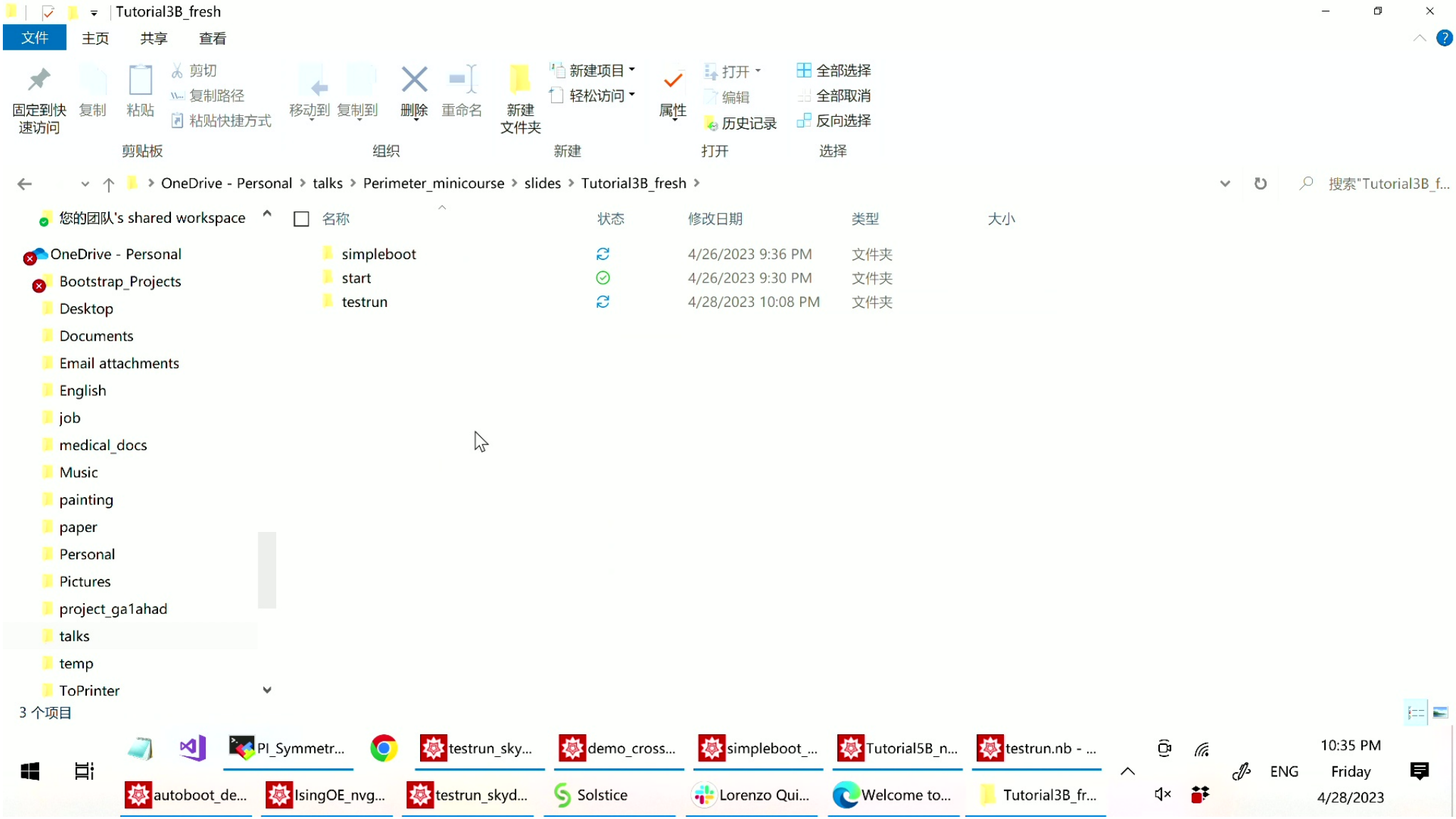
AutoCB3$Condition[GapConfigurationFunc] : produce a list of "positive matrix with prefactor" using GapConfigurationFunc
AutoCB3$Condition[GapConfiguration_List] : produce a list of "positive matrix with prefactor" using GapConfigurationFunc

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 $\Delta >$ gap and L in spins. spins can be a integer or set of integers. gap can be Δunitary[dim,/]
{channel,IndividualOperator[Δ0],spin} // demand $\alpha \cdot (F_{\text{channel},\Delta 0,\text{spin}}) \geq 0$
{channel,IndividualOperator[Δ0,ope_List],spin} // demand $\alpha \cdot (\text{ope}.F_{\text{channel},\Delta 0,\text{spin}}.\text{ope}) \geq 0$
{channel,IntervalPositivity[Δmin,Δmax],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 numbers.

125%


Tutorial3B_fresh
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
OneDrive - Personal › talks › Perimeter_minicourse › slides › Tutorial3B_fresh ›
搜索"Tutorial3B_f...
您的团队's shared workspace
名称
状态
修改日期
类型
大小
OneDrive - Personal
Bootstrap_Projects
Desktop
Documents
Email attachments
English
job
medical_docs
Music
painting
paper
Personal
Pictures
project_ga1ahad
talks
temp
ToPrinter
simpleboot
4/26/2023 9:36 PM
文件夹
start
4/26/2023 9:30 PM
文件夹
testrun
4/28/2023 10:08 PM
文件夹
3 个项目
PI_Symmetr...
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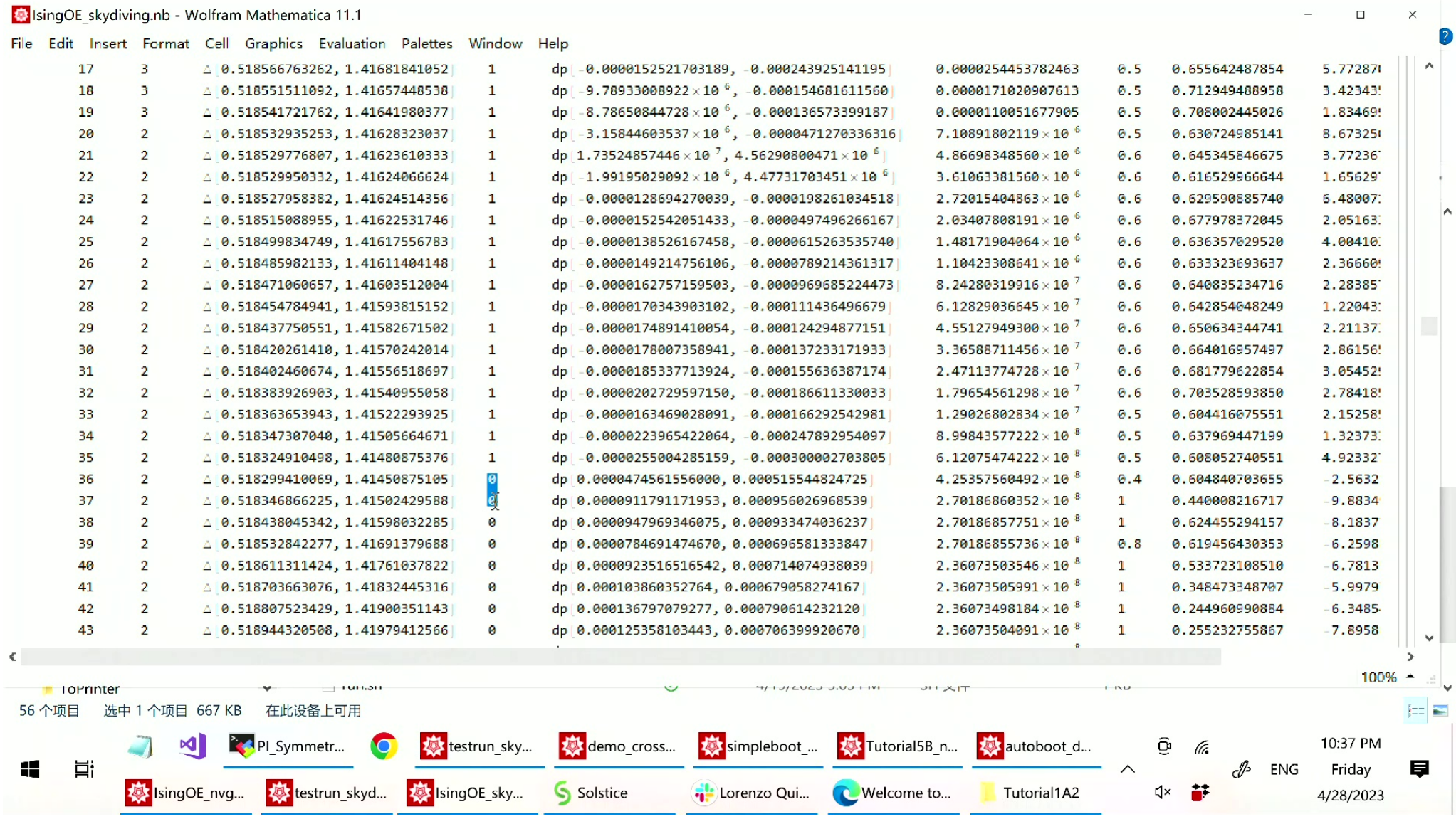
IsingOE_skydiving.nb - Wolfram Mathematica 11.1
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18 3 {0.518551511092, 1.41657448538} 1 dp {-9.78933008922×10^6, -0.000154681611560} 0.0000171020907613 0.5 0.712949488958 3.42343
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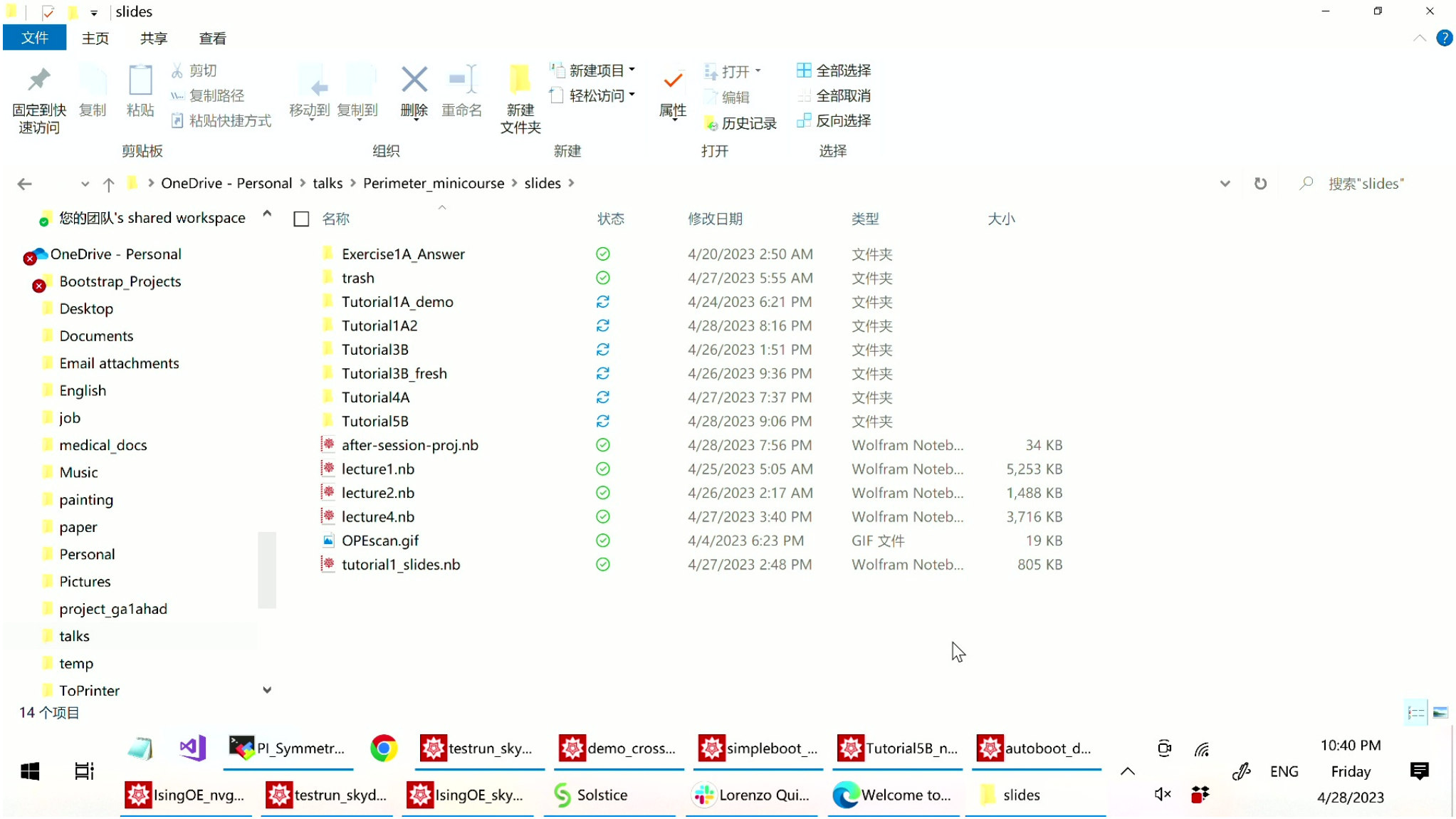
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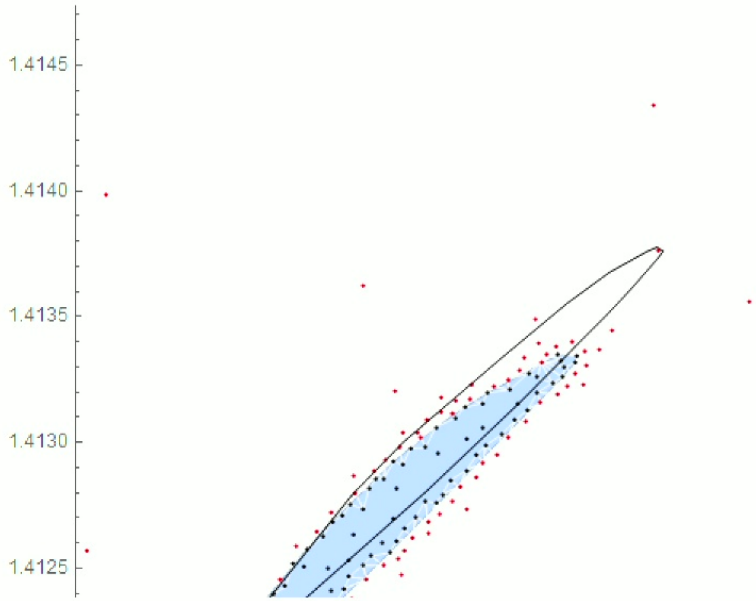
O(N) vst, vstt4 for N=4,5,6,7... 1/N

O(N) vst explore O(N) continent

Explore different derivative for different correlator



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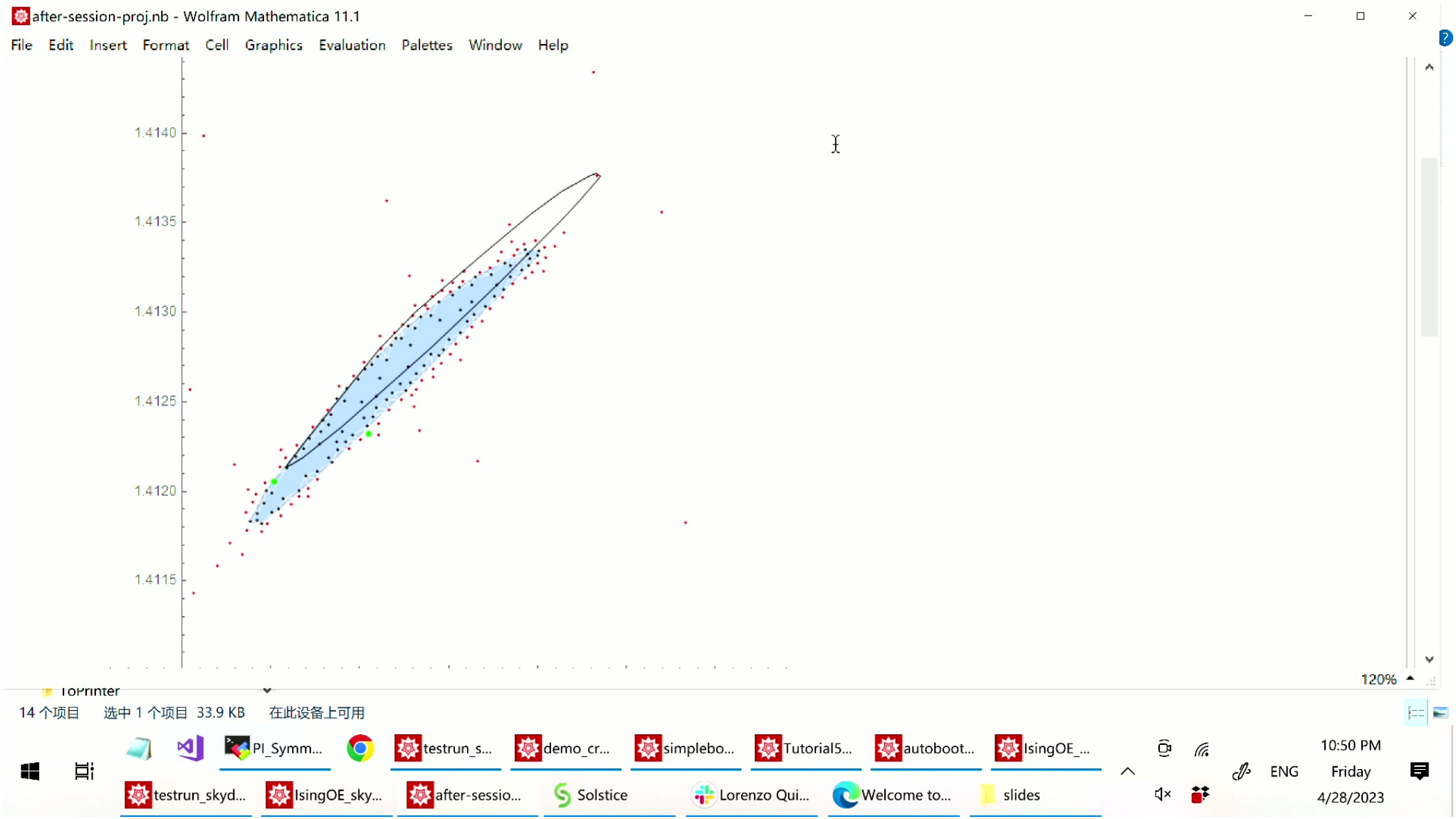
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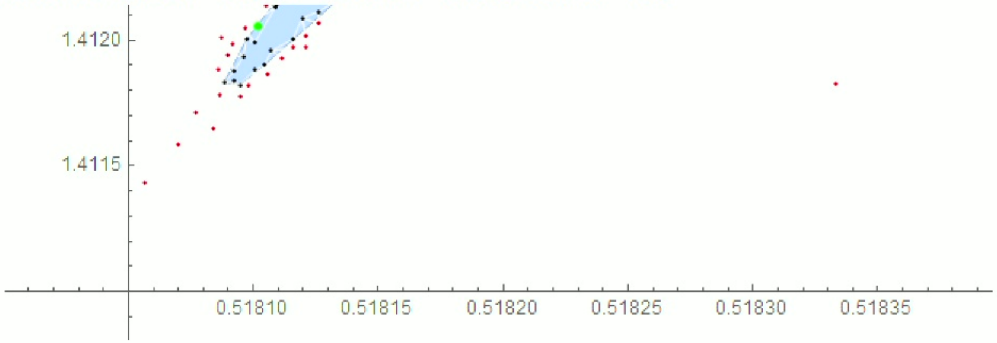


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blockconfobj = {"dim" → 3, "Λarray" → {19, 19, 19, 15, 23}, "κ" → 30, "rN" → 120,
   "lset" → Range[0, 44] ~ Join ~ {47, 48, 51, 52, 55, 56, 59, 60, 63, 64, 67, 68}}
```

Explore C2 discontinuity and single correlator bound

Restricted Potts model

Super-Ising σ, σ' mix

O(N) v,s,t,t4 with large charge analytics

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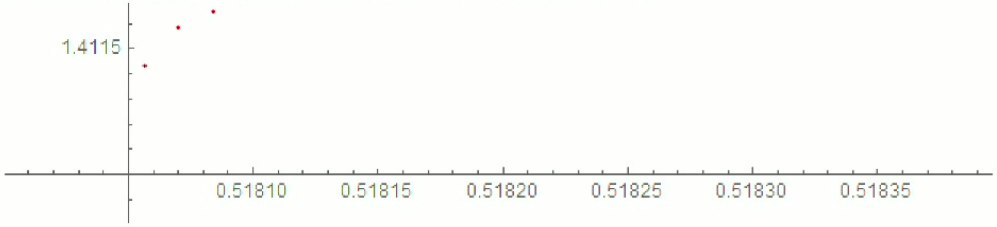


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```

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