

Thanks for participating in the MCnet machine learning school!

...held virtually from Lund, Sweden, June 22-26, 2020

Local organizers: Malin Sjö Dahl and Stefan Prestel

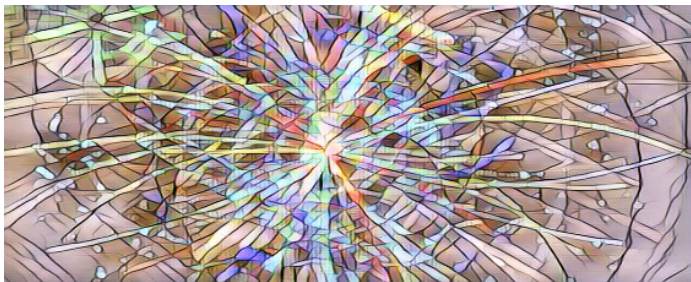
with lots of support from Ann Durie & Mike Seymour



Many thanks to an excellent crew!



And thanks a lot to all students for participating, for feedback and questions!



During the week, we've  
... all learned about the intricacies of zoom

...and we visited many exotic places

The screenshot shows a Zoom meeting interface. The main content is a presentation slide titled "Neural networks for precision simulations". The slide is divided into two sections: "Problems in MC simulations" and "Solution with neural networks".

**Problems in MC simulations**

- High-dimensional phase space
- Low unweighting efficiency
- CPU time increase per order in precision  $\sim \times 100$
- Slow detector simulations

**Solution with neural networks**

- Flexible parametrisation
- Interpolation properties
- Fast evaluation
- Multiple generative models: GAN, VAE, normalizing flow

The slide footer includes "Alec Butter" on the left, "MITer Machine Learning School 2020" in the center, and "8 / 44" on the right. A small video thumbnail of a participant named "butter" is visible in the bottom right of the slide area.

The Zoom meeting title bar shows "Zoom Meeting" and a green notification: "You are viewing butter's screen". The "Participants (34)" list on the right includes:

- SP Stefan Prestel (Host, me)
- MS Malin Sjödahl (Co-host)
- B butter (Guest)
- AP Alan Price (Guest)
- AV Andres Vasquez (Guest)
- AL Andrew Lifson
- AS Andrzej Siodmok (Guest)
- B Baptiste Cabouat (Guest)
- CW Chang Wu (Guest)
- CP Christopher Plumberg (Guest)
- DL Daniele Lombardi (Guest)
- Emil Rotors
- ES Emma SD (Guest)
- Graeme Nail (Guest)
- JA Jack Araz (Guest)
- Jr Julian Truchanov (Guest)

The Zoom control bar at the bottom includes icons for Unmute, Stop Video, Security, Participants (34), Polls, Chat, Share Screen, Record, Breakout Rooms, and an End button.

...and we visited many exotic places

Zoom Meeting

You are viewing Stefano Carrazza's screen

### Grooming a jet tree with DRL

**Input data:**

Generate jet events with Monte Carlo. Define a set of possible **states** in a five dimensional box:

$$s_t = \{z, \Delta_{ab}, \phi, m, k_x\}$$

**Methodology:**

Jet grooming is characterized by a policy and a sequential set of actions/cuts, so:

- Train a reinforcement learning **agent** which learns how to decide which **action** to take.
- Define an environment **reward** which motivates the agent to groom efficiently.

**Reinforcement learning**

```
graph TD; Input[Input Data] --> Agent[Agent]; Agent -- Best Action --> Environment[Environment]; Environment -- Reward --> Agent; Environment --> Output[Output]; subgraph Algorithm; Agent; Environment; end
```

42

Participants (36)

Find a participant

- SP Stefan Prestel (Host, me)
- MB Malin Sjö Dahl (Co-host)
- SC Stefano Carrazza (Guest)
- AP Alan Price (Guest)
- A andreas.papaefstathiou@cern.ch (Guest)
- AV Andres Vasquez (Guest)
- AL Andrew Lifson
- AS Andrzej Siodmok (Guest)
- A Anja (Guest)
- B Baptiste.Cabouat (Guest)
- CW Chang Wu (Guest)
- CP Christopher Plumberg (Guest)
- DL Daniele Lombardi (Guest)
- DB Debottam Bakshi Gupta (Guest)
- ED Eleonora Diociaiuti (Guest)

Stefano Carrazza

Unmute Stop Video Security Participants Polls Chat Share Screen Record Breakout Rooms End

Invite Mute All

...and we visited many exotic places

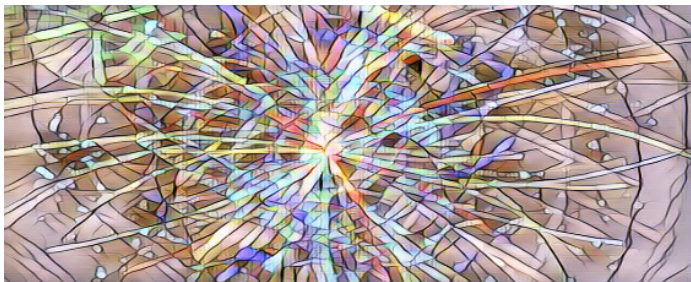
The screenshot shows a Zoom meeting interface. The main window displays a Jupyter Notebook titled "Autoencoder-EX: Use Clustering to tag images". The notebook content includes the following code:

```
The steps of building the model:  
Encoder = DNN(10)  
Decoder = DNN(10)  
+ Sequentially add pretrained GAN  
encoder = FF_Net(nn.Sequential(Layer_List()))  
decoder = FF_Net(nn.Sequential(Layer_List()))  
Autoencoder = FF_Net(nn.Sequential(encoder, decoder))  
+ Model compilation  
class Autoencoder(FF_Net_Model):  
    def __init__(self):  
        super(Autoencoder, self).__init__()  
        encoder = self.encoder()  
        decoder = self.decoder()  
        self.autoencoder()  
        self.compile()  
        self.encoder()  
        self.decoder()  
        self.compile()  
        self.encoder()  
        self.decoder()  
        self.compile()
```

The right sidebar shows a list of 25 participants:

- SP Stefan Prestel (Host, me)
- NA Najmeh Abiri (Guest)
- AL Andrew Lifson
- CP Christopher Plumberg (Guest)
- Emil Rofors
- ES Emma SD (Guest)
- Graeme Nail (Guest)
- JA Jack Araz (Guest)
- JT Julien Touchéque (Guest)
- KO Kiran Ostrolenk (Guest)
- LG Leif Gellersen
- LM Luca Mantani (Guest)
- MS Malin Sjö Dahl
- MH Marian Heil (Guest)
- MU Marius Ulthelm (Guest)
- Max Konha (Guest)

The bottom of the screen shows the Zoom control bar with buttons for Unmute, Start Video, Security, Participants (25), Polls, Chat, Share Screen, Record, Breakout Rooms, and End.



During the week, we've

- ... all learned about the intricacies of zoom
- ... had lively lectures and hands-on sessions
- ... learned about many ML topics in different contexts

**Hopefully some of you are now enthusiastic about the possibilities of ML!**

Now, we need your feedback! Did you like the experience?

You'll soon receive an email with a feedback/evaluation form.

Please fill this – it's really important feedback for us!



Hope you enjoyed the school.  
Stay safe and enjoy the summer!

