



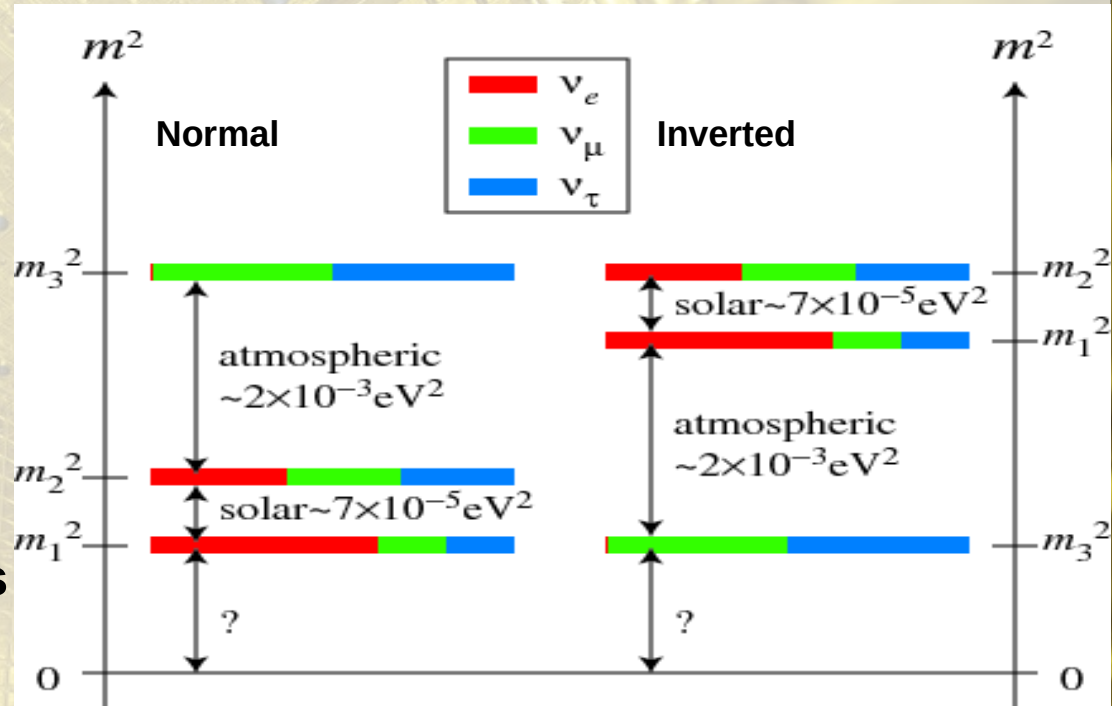
Neutrino Group Overview

Melissa Uchida

HEP Extravaganza 2023

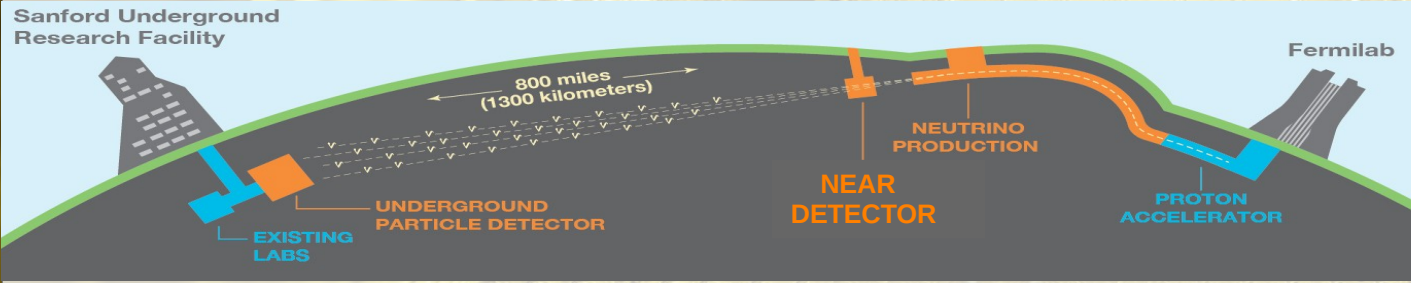
Why We Care About Neutrinos

- Is there CP violation in the lepton sector?
 - **Matter Anti-Matter asymmetry...**
- What is the neutrino mass hierarchy?
 - **Cosmological implications**
- Octant of mixing angle θ_{23} ?
- Are there other neutrinos yet to be discovered?
 - **How do neutrinos get their mass**
- **Unification of the forces**
 - Proton Decay



$$\begin{pmatrix} \nu_e \\ \nu_\mu \\ \nu_\tau \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & c_{23} & s_{23} \\ 0 & -s_{23} & c_{23} \end{pmatrix} \begin{pmatrix} \text{solar} & & \\ c_{13} & 0 & s_{13} e^{-i\delta} \\ -s_{13} e^{-i\delta} & 0 & c_{13} \end{pmatrix} \begin{pmatrix} \text{atm \& reactor} & & \\ c_{12} & s_{12} & 0 \\ -s_{12} & c_{12} & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \text{atm} & & \\ \nu_1 \\ \nu_2 \\ \nu_3 \end{pmatrix}$$

Where
 $c_{ij} = \text{Cos } \theta_{ij}$,
 $s_{ij} = \text{Sin } \theta_{ij}$,
 2



What We Do

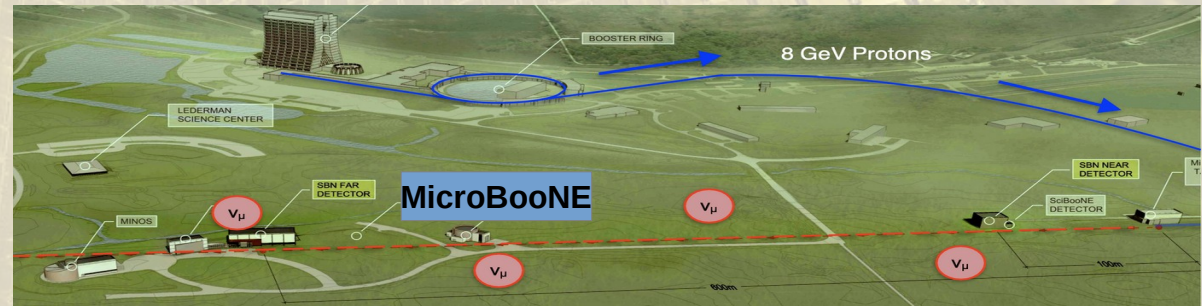


DUNE:

- Pandora_ND Reconstruction
- DUNE Simulation and Reconstruction Convenor
- ProtoDUNE Reconstruction Convenor
- Analysis / Cross Sections / Proton Decay
- Hardware (Near and Far detectors)

MicroBooNE:

- LEE Analysis
- Cross Sections
- Reconstruction



Who We Are



Leigh Whitehead

ProtoDUNE Physics Convenor

(Prev: Convenor of the DUNE simulation and reconstruction group)



M.D. J.P. Detje S. Veyani
Dennis Uchida A.F. Moor N. Timischi

Absent: L. Whitehead

- Papers Published:

- ProtoDUNE-SP
arXiv 2211.01166

- Application of transfer learning
to neutrino interaction
classification
arXiv 2207.03139

- Lectured on computer vision in
neutrino physics at the SLAC
summer school.

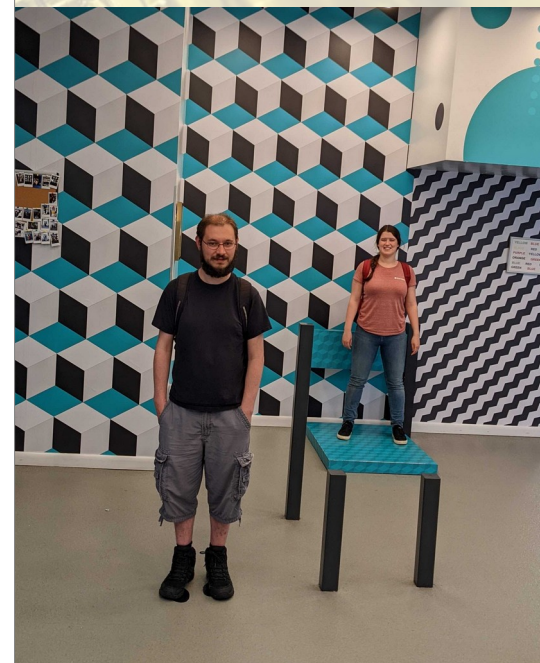
- *Being away almost every time
a photo was taken..*



Steve Dennis

DUNE Pandora_ND and DUNE CRC Committee
MicroBooNE Reconstruction

- DUNE Near Detector Reconstruction: toolchain for ProtoDUNE-ND from simulation through reconstruction to analysis level.
- *Learning to type left handed...*



Alex Moor

Final throes of her PhD Submitting within the next month!



Santa's Checklist



Alex Moor

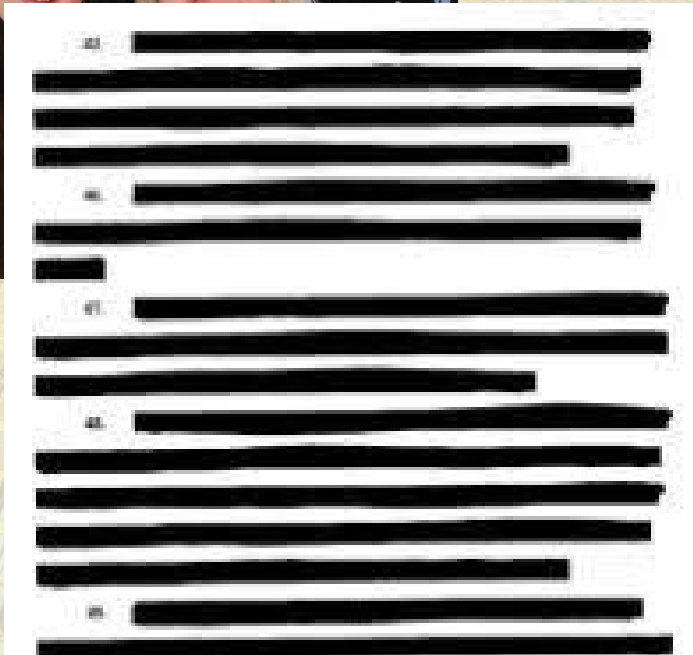
Final throes of her PhD Submitting within the next month!



- Pandora ND
- DUNE Hardware
 - NDLaR
 - Far detector readout PCBs
- MicroBooNE ν_e/ν_μ Ratio Analysis
 - **Soon** to be published
- *Surviving writing up*

Alex Moor

Final throes of her PhD Submitting within the next month!



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Jingyuan Shi

4th Year PhD Student DUNE and ProtoDUNE

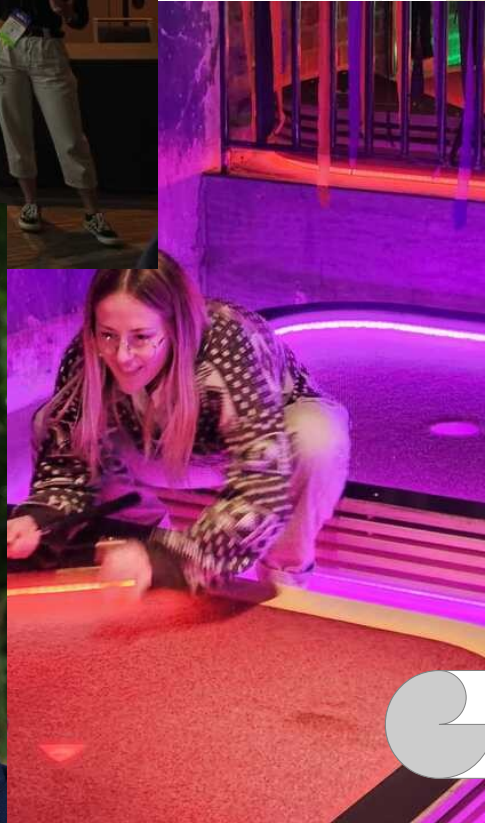


- ProtoDUNE SP 3 GeV proton Analysis – **soon** to be published – cant be shown
- DUNE Far Detector Hardware
- Pandora NDLaR
- *Endlessly packing and unpacking boxes*

Karolina Wresilo

4th Year PhD Student DUNE and MicroBooNE

- MicroBooNE LEE
- MicroBooNE X Sections – to be published
- *DUNE Near Detector LAr Demonstrator*
 - Light Readout Expert
 - end-to-end ND LAr analysis infrastructure
- *Trying to match mismatched time stamps*



Philip Detje

3rd Year PhD Student DUNE and MicroBooNE



- MicroBooNE
 ν_{μ} CC \rightarrow π^+ Np Inclusive cross section on full uB data set.
- Publication and announcement set for Neutrino 2024!
- *Driving the biggest truck anyone in Europe has ever seen for 3 months*

Natsumi Taniuchi

3rd Year PhD Student DUNE and MicroBooNE

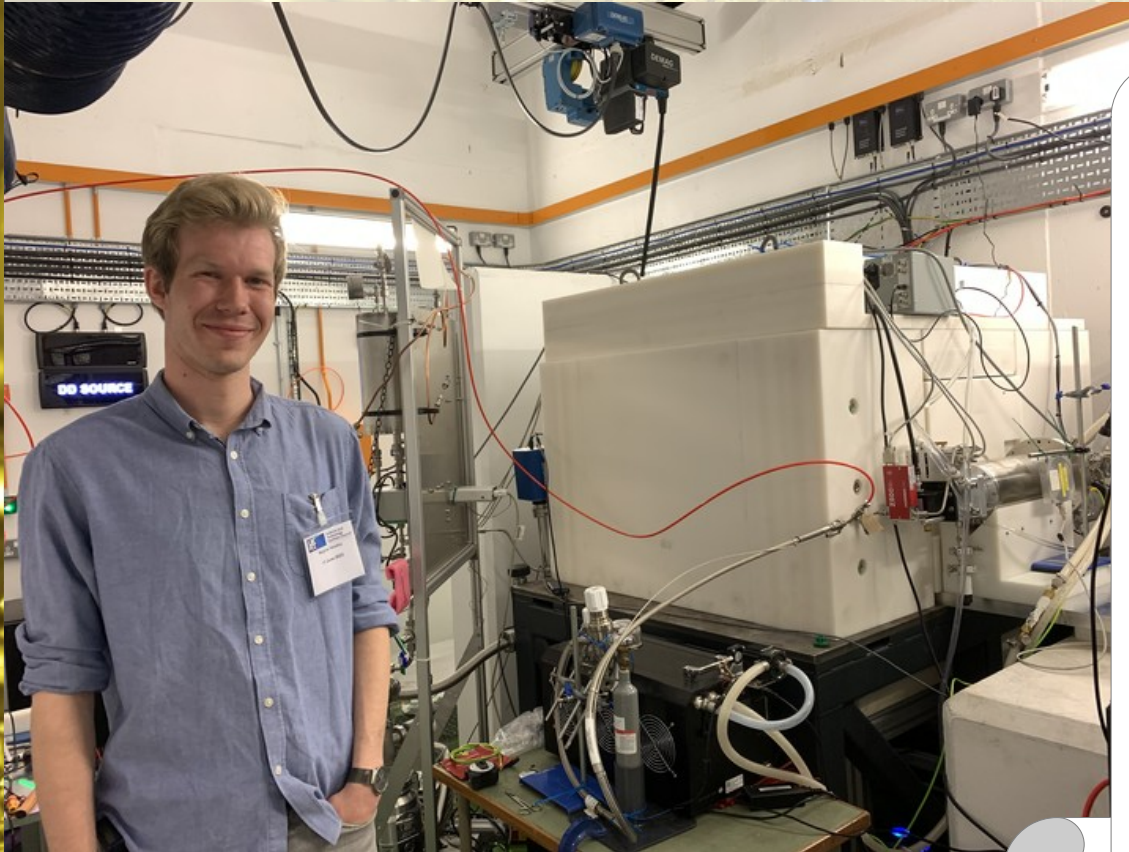


- 1st Kaon Cross section with NuMI beam (MicroBooNE) – soon to be published
- Full K⁺ analysis now also for DUNE and proton decay analysis starting very soon
- *Survived lost luggage on the way to and from the DUNE CM in Colombia*

[REDACTED]

Magnus Handley

1st Year PhD Student DUNE and
MicroBooNE



- DUNE Hardware
 - Designing and implementing long term tests of effect of humidity and temperature on stored DUNE APA PCBs
- *Coming second in NeutrinoFest Crazy golf*

In Summary / A word of warning



Melissa Uchida

ELECTRIC GREENS

1ST

KAROLINA (30)

2ND

STEVE (32)

3RD

STEFANO (32)

4TH

NATSUMI (33)

5TH

ALEX (34)

ELECTRIC GREENS

1ST

MAGNUS (31)

2ND

LEIGH (33)

3RD

PHILIP (40)

4TH

JING (40)

5TH

MELISSA (42)