LECTURE 1:
Introduction and Preview

ML-4430: Machine learning approaches in climate science

21 Apr 2021

Getting to know each other

1

- Who am I?
- Who are you?

What's in store

2

- Lecture plan
- Teaching Methods
- Learning Targets

Evaluation Criteria

3

- Weekly recaps
- Project presentation
- Project report

Miscellaneous

4

- A few comments
- Online resources
- Q & A

Outline

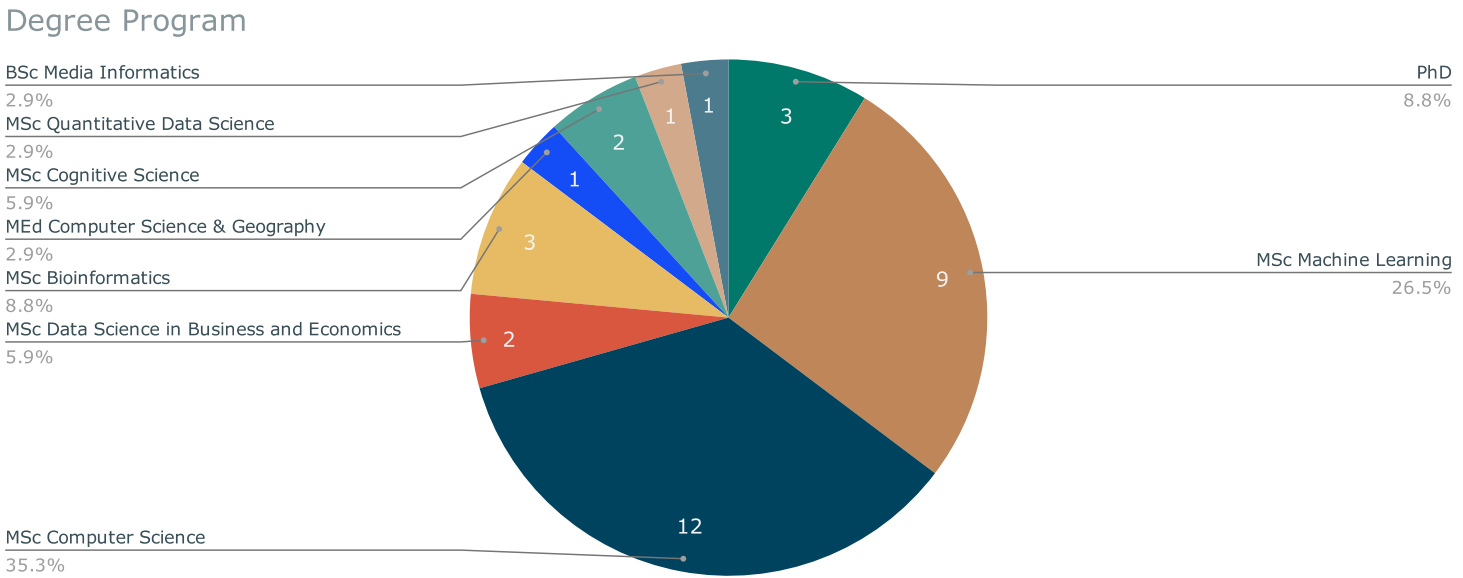
Bedartha Goswami

- Research group leader, since 2020
- PhD in “Climate Physics,”
  University of Potsdam, 2015
- Physicist by training
- Nonlinear time series analysis; (Bayesian) statistics; classical learning; complex networks

machine learning in climate science

Round of introductions

- Briefly introduce yourself (< 1 minute)
  - What is your name?
  - What are you studying?
  - What is your background?
  - Why do you want to take up this course?



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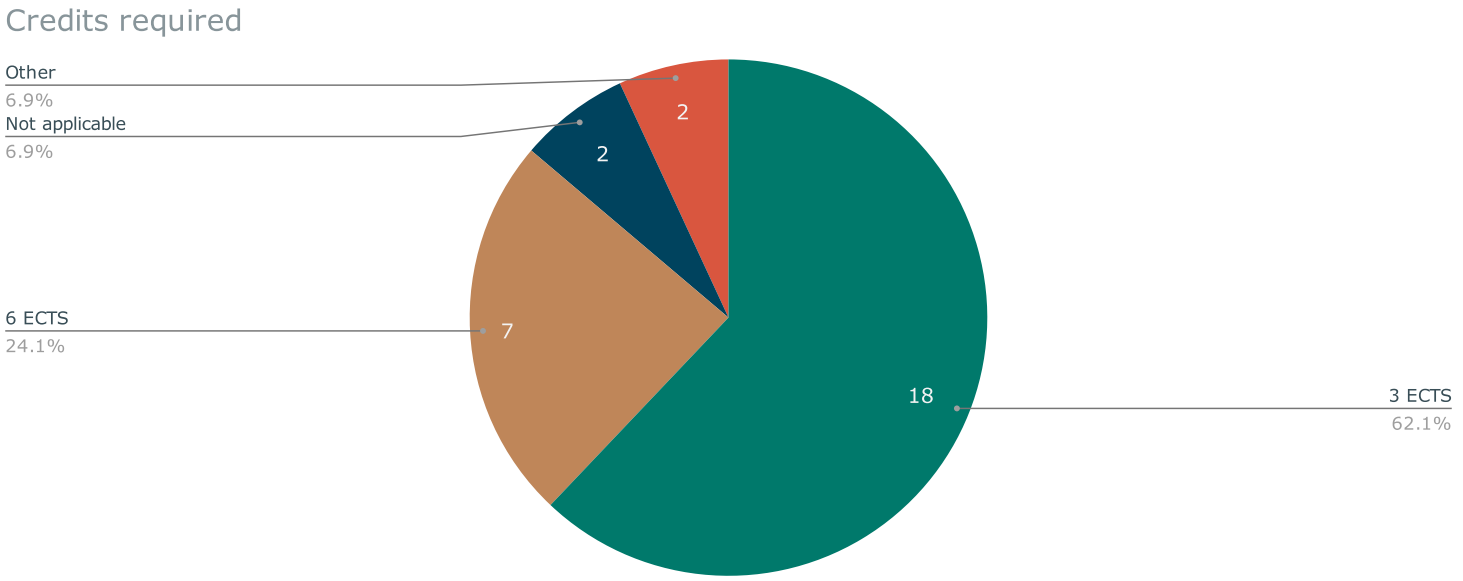

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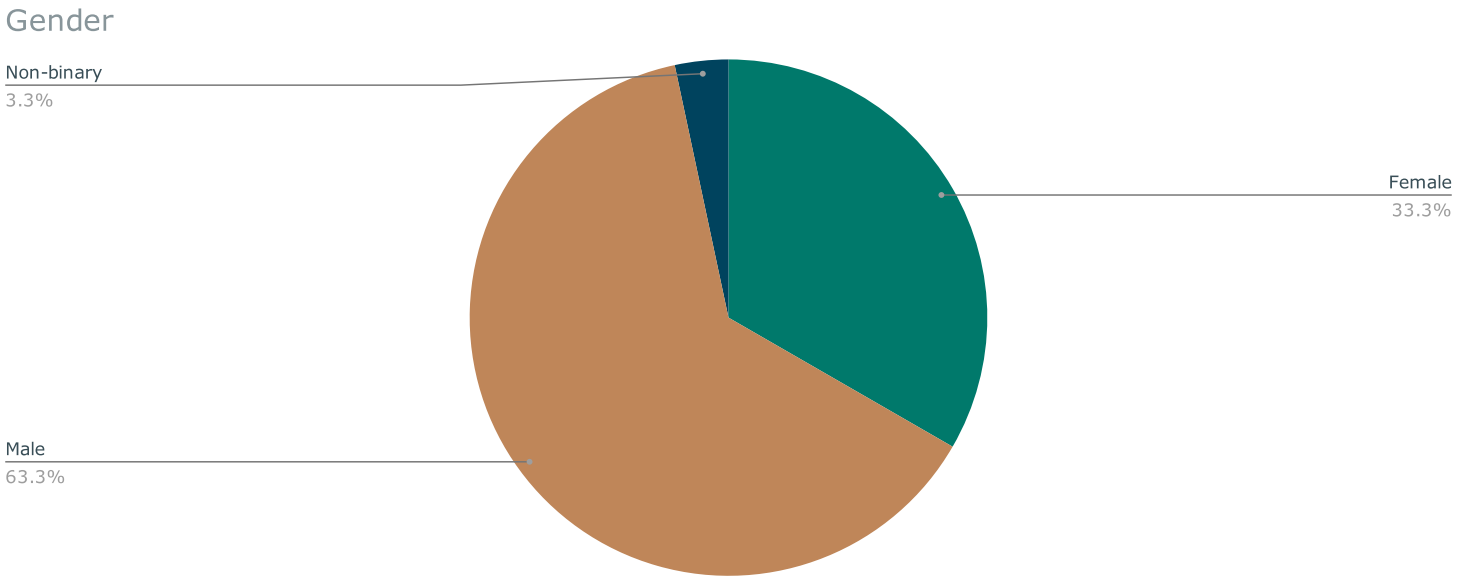

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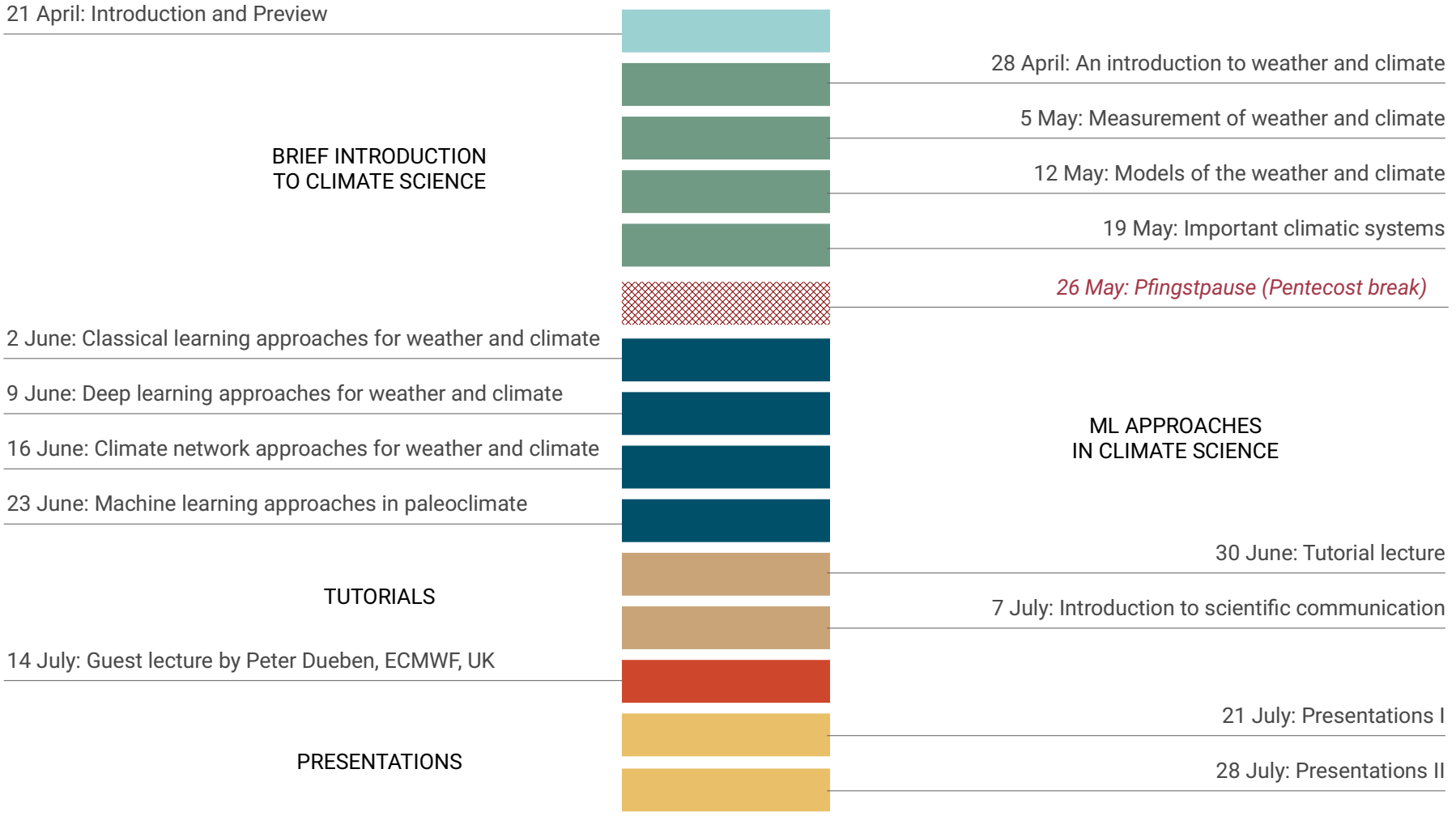

2. What's in store → Lecture plan

Lecture timings

- Wednesdays, 10:00 – 12:00

Office timings for discussion

- Wednesdays, 15:00 – 17:00
- Send an email to me
- We will meet on Zoom

Lecture material (slides, papers, etc.)

- Course webpage
  - https://machineclimate.de/teaching/summer2021/

Deadline for project ideas

- **31 May 2021**

- **The lectures should be ...**
  - Interactive, dialogic, participatory
  - Please ask questions!

- **We will also read ...**
  - Journal articles to know the SOTA
    - Articles will be sent around the week before

- **Weekly recaps before every lecture**
  - Presented by groups of 4 students
    - Chosen after the lecture

- **Evaluation based on**
  - **Project**: equal weight to oral presentation and written report (three quarters)
  - **Weekly recaps** (one quarter)

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WORKLOAD

- **3 ECTS Course**

- **90 h in total** for the entire semester
  - 90 h = 30 h lecture + 60 h self study

- **6 h per week** for 15 weeks
  - 6 h = 2 h lecture + 4 h self study

- Basic understanding of climate
- How do we measure the climate
- What are the important climatic systems that make the world ‘tick’
- What are the classical and SOTA ML approaches that have found use in climate science
- How to read a scientific article on a climate topic
- How to write a scientific paper on a climate topic

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I WILL BE REALLY HAPPY IF ...

- **You can understand and absorb climate science SOTA literature**
- **You can identify open questions in climate science**
- **You are motivated to apply SOTA ML techniques to address open questions in climate science**

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Weekly recaps

- Recaps of the core course lectures
  - Lectures 2 – 9
- Implies we will have recaps at the start of lectures 3 – 10
- 4 students assigned at the end of lectures 2 – 9
- At the start of Lectures 3 – 10
  - 4 presentations of 5 minutes each

ABOUT THE TERM PROJECT

- List of topics
  - Before Lecture 2 (27 April)
  - You can also choose your own
  - Choose early and discuss with me

- Project must include
  - SOTA literature survey
  - Clear hypothesis
  - Validation using climate data sets
  - Clear interpretation of results

- Project may include
  - Reproduction of earlier results
  - Testing new ideas
  - Topical review

Project presentation

- Topic has to be chosen before 31 May
- Start early → topics need refinement
- Presentation of 15 mins total
  - **12 mins talk + 3 mins Q&A**
- Presentations in English
- Evaluation criteria:
  - Clarity
  - Creativity
  - Integrity
  - **Results not important**

Project report

- Details of the term project
- Written like a scientific paper (**L11**)
- Report typed out using LaTeX
  - **Format will be provided soon**
- Report in English
- Evaluation criteria:
  - Clarity
  - Creativity
  - Integrity
  - **Results not important**

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A few comments

- This course is not about
  - Climate change
  - Environment

- The lectures do not directly involve
  - ***Coding***, but the project will require you to code (most likely)
  - ***Textbooks***, but we will use many journal articles and book chapters

- You will not become climate experts at the end, but masters of the basics

Online resources related to the course

- Course webpage
  - https://machineclimate.de/teaching/summer2021/
- YouTube (unlisted) playlist “Intro to Climate Science”
  - https://www.youtube.com/watch?v=lrPS2HiYVp8&list=PLHcgIwZgPw17-qEPuhClxp-6afchvNhbN
- AMS Short courses
  - Python for Climate and Meteorology
    - Day 1: https://youtu.be/uQZAEPnUZ5o
    - Day 2: https://youtu.be/vVQxr6UaCl4
    - Day 3: https://youtu.be/8TFohhk4xzI
    - Day 4: https://youtu.be/_aFxBF3Jezs

4. Miscellaneous → Q&A