

Teaching Philosophy

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We live in a complex world. It is very important that students have a sense of how to reason about the complexity around us using computational tools. I want to give students a feel for how to leverage big data and data science and use it to gain a quantitative understanding of our complex world.

Inter-disciplinary data science is a key focus of my teaching philosophy. In order to understand complex systems and solve problems, data science practitioners will have to talk with different stakeholders to understand problems and communicate solutions to them. I want to train the next generation of data science practitioners to tackle the complex problems being faced by humanity.

I have also trained working professionals in industry and incorporate industry best practices in my teaching. I have experience working in industry and have implemented software systems running in production on critical data. I also have experience engaging with industry and other diverse stakeholders.

I would also like to teach students skills that will help them to solve the problems faced by industry. These skills will be related to implementing production systems in data science and communicating with business experts.

TEACHING EXPERIENCE

I am teaching machine learning at the University of Cambridge Bioinformatics Training Centre. I have also taught students in Uganda through the University of Cambridge Africa programme. Previously I taught at the University of Oxford Complex Networks Summer School and the University of New Mexico.

I really enjoy inter-disciplinary teaching. I have taught students from diverse disciplines that include Computer Science, Chemistry, Philosophy, Ecology and Biology.

BACKGROUND

I thoroughly enjoy the process of teaching as I give students an appreciation of the role of complex systems in everyday life. In previous classes I have shown students how to apply models to data that they bring. I also gave students a sense of the wonder and joy that can come from studying complex systems and complex phenomenon in biology.

I want to make teaching a personal and an enjoyable experience for my students. It is very important that students assimilate what is being taught. I like to teach through concrete examples.

STUDENT PARTICIPATION

I ask students a lot of questions to get them engaged. My teaching style is very interactive and hands-on where students take an active part in discussions. I believe it is very important to engage students. They can form a personal connection with the subject and be involved in the process of learning.

I encourage students to start thinking critically on their own and ask questions. My classes have peer and instructor-led discussions, where students freely share their ideas. I encourage students to think outside the box and they are free to express contradictory opinions. I want my students to feel that they have gained useful concepts, tools and insights at the end of the class.

I also ensure that students who are introverted or shy actively participate in the class. I seek out students who are lagging behind and give them personalized attention in the classroom and during office hours so that they can understand the material. I have tutored in the past and helped students clarify their doubts.

TEACHING STYLE

I would like to give a concrete example of my teaching style. I had lectured on using simple dynamical systems models to simulate different complex systems. I was able to engage the students when I showed them how one can use very simple models to capture dynamics in different complex systems (like spread of viruses, spread of ideas and how crime is propagated in cities). The students then experimented with these models and applied them to new scenarios and generated insights into the dynamics of the models.

TECHNOLOGY

I use technology and blended learning techniques to engage students. These include graphical user interfaces and interactive environments. These tools complement my hands-on teaching style. I encourage my students to play around with computer programs and user interfaces to build interactive prototypes to solve problems in complex systems.

I also make my teaching resources freely available on my website for use by others (<https://sites.google.com/site/neelsoumya/teaching>) and (<https://osf.io/25gnz/>).

COURSES

A list of courses that I can teach are:

- 1) Machine learning
- 2) Data science and analytics
- 3) Python, R, C, C++, MATLAB
- 4) Software engineering best practices and software carpentry (source control, issue tracking)
- 5) Bayesian techniques, Markov chain Monte Carlo
- 6) Ordinary differential equations and dynamical systems
- 7) Theory of Computer Science
- 8) Programming languages theory
- 9) Software Engineering
- 10) Systems Biology

A full fledged course will include basic programming (using scripting languages), basic biostatistics, machine learning, bioinformatics, non-linear dynamical systems and complex systems. A data science course will also include preliminaries of business processes, business communications skills, data visualization skills, data science engineering (scaling up and deploying solutions using technologies like Kubernetes, AirFlow) and a capstone project preferably with an industry partner.

TEACHING TRAINING

I have been trained in teaching at the University of Oxford Doctoral Training Centre and the Cambridge Centre for Teaching and Learning at the University of Cambridge.

TEACHING REVIEWS

I have had very encouraging reviews from students. Some samples of student reviews are:

“... the presentation was very interesting. I could have listened for another hour or 2.”

“All I can say is "wow". How very interesting “

TEACHING OUTREACH AND POPULARISATION ACTIVITIES

I am very interested in developing course materials for use in developing nations and learners in resource constrained environments. I am very passionate about using educational tools for outreach. I regularly review teaching material for a non-profit organization called SIMIODE. My contributions as a reviewer of peer-reviewed course material have been acknowledged by SIMIODE. I have also co-designed teaching resources with educators to make my teaching broadly accessible to classrooms.

These teaching resources are available online at <https://osf.io/25gnz/>.

A sample of my teaching material is also available online

<https://www.simiode.org/resources/3206>