## AI in the Sciences and Engineering

## Siddhartha Mishra & Ben Moseley

- 1. Course Introduction
- 2. Introduction to Deep Learning Part 1
- 3. Introduction to Deep Learning Part 2
- 4. Importance of PDEs in Science
- 5. Physics-Informed Neural Networks -Introduction
- 6. Physics-Informed Neural Networks -Limitations and Extensions Part 1
- 7. Physics-Informed Neural Networks -Limitations and Extensions Part 2
- 8. Physics-Informed Neural Networks -Theory Part 1
- 9. Physics-Informed Neural Networks -Theory Part 2
- 10. Introduction to Operator Learning Part 1
- 11. Introduction to Operator Learning Part 2
- 12. Fourier Neural Operators
- 13. Spectral Neural Operators and Deep Operator Networks
- 14. Convolutional Neural Operators
- 15. Time-Dependent Neural Operators
- 16. Large-Scale Neural Operators
- 17. Attention as a Neural Operator
- 18. Windowed Attention and Scaling Laws
- 19. Introduction to Hybrid Workflows Part 1
- 20. Introduction to Hybrid Workflows Part 2
- 21. Neural Differential Equations
- 22. Introduction to Diffusion Models

- 23. Introduction to JAX
- 24. Symbolic Regression and Model Discovery
- 25. Applications of AI in Chemistry and Biology Part 1
- 26. Applications of AI in Chemistry and Biology Part 2
- 27. Materials

## Supplementary Materials

- 1. Neural ODEs A, B
- 2. Neural Tangent Kernel
- 3. Topic about Operator Learning
- 4. Kolmogorov-Arnold Networks A, B

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