Unit overview

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Intended learning outcomes of the unit

1. Implement advanced numerical methods for the solution of real-world problems.
2. Select, assess, modify and adapt numerical algorithms, guided by an awareness of their mathematical foundations.
3. Apply appropriate computational techniques to solve ODE problems.
4. Apply appropriate computational techniques to solve PDE problems.
5. Create production-standard code, based on sound software engineering principles.

Numerical algorithms – ordinary differential equations

- Initial value problems
  - Euler's method, Runge-Kutta, other types of IVP solvers
- Boundary value problems
  - Numerical shooting
  - (Finite differences to come later)
- Numerical continuation
  - Natural parameter continuation and pseudo-arclength continuation

Software engineering

- Version control software
  - Git
- Package version control
  - Virtual environments
- Software testing
  - Unit tests, doc tests, continuous integration
- Code review
  - Pair programming, pull requests

Applicable to all programming tasks!

Assessment

- See assessment page on the website
  - Long but please read!
- Weekly exercises are integrated to give you the coursework
  - Shouldn’t need to do much extra work
- Individual weeks can (mostly) be done separately
- Final code should be a library (like SciPy)
- Final report should be a Jupyter Notebook
  - Import your library and use it – don’t copy-and-paste in the code!

Assessment – report – reflective learning log

From the Open University reflective thinking can be described as

- thinking with a purpose
- being critical, but not negative
- analysing how effective your learning is
- questioning and probing
- making judgements and drawing conclusions.

https://help.open.ac.uk/be-aware-of-your-habits

Assessment – report – reflective learning log

- What did I learn about the mathematical algorithms?
- What did I learn about software engineering? How have I progressed in my abilities?
- What are the short-term implications of what I've learnt? (When will it be useful?)
- What are the long-term implications of what I've learnt? (When will it be useful?)
- What would I have done differently if I started the unit over again?
- What will I do differently in the future?

Make notes each week!