TATM85 – Applications of Functional analysis

Functional analysis = rigorous theory for solving problems in mathematical analysis and applications, where solutions are functions, not only numbers.

Function spaces, integrals and **operators** are fundamental and helpful in:

- Solving differential equations, simulations, image/signal processing, ...

- Representing and approximating functions (signals, images, flow, data, ...) efficiently in computers.

- Fourier series/transformations, wavelets, finite element method (FEM), ...

- In which sense do the approximations **converge** to their limiting functions, e.g. to solutions of differential equations and other problems ...?
  When are two functions "close to each other"?

- Theory of distributions and generalized functions (Dirac's delta-function, weak derivatives, Sobolev spaces ...)

- Various types of **convergence** in probability theory
  (almost surely, in probability, in distribution, weakly, ...)