

SCIENTIFIC COMPUTING – 9 CFU
Short Syllabus – 2024/2025
Prof. Giulio Giunta

Review of basic Numerical Linear Algebra: vector/matrix arithmetic, linear spaces and basis, linear transformations, eigenvalues/eigenvectors

Orthogonal matrices - QR factorization - Singular value decomposition (SVD) – dimension reduction

Solving systems of nonlinear equations

Constrained and unconstrained minimization - gradient descent method and its variants (moments, ADAM, SGD) - Newton's and LM methods

Google PageRank algorithm

Markov chains

Computing derivatives: finite differences - symbolic differentiation - automatic differentiation, forward mode and reverse mode - backpropagation in training neural networks

Discrete Fourier Transform - FFT algorithms - Fourier Series - Fourier Transform

Continuous and Discrete Wavelet Transforms