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Design for *IGA*-type discretization workflows

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1ˢᵗ Technical Workshop

DC 2 Presentation

Presenter name: Polytimi Zisimopoulou
Email: polytimi.zisimopoulou@upc.edu
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Isogeometric discretizations in computational solid mechanics

Subtitle

❖ **Supervisors**

Lucia Gratiela Barbu, Alejandro Cornejo

❖ **Main objectives achieved**

Introduction to Structural Analysis
Introduction to C++
1D Isotropic Damage Models
Development of 2D Isotropic Damage Models

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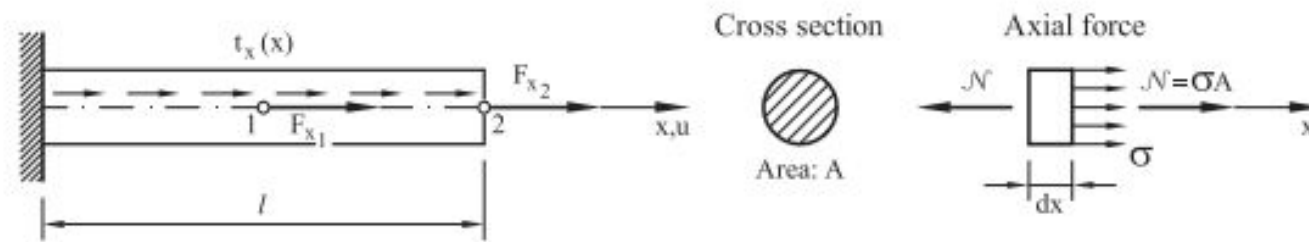Design for *IGA*-type
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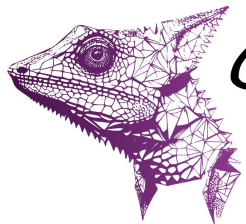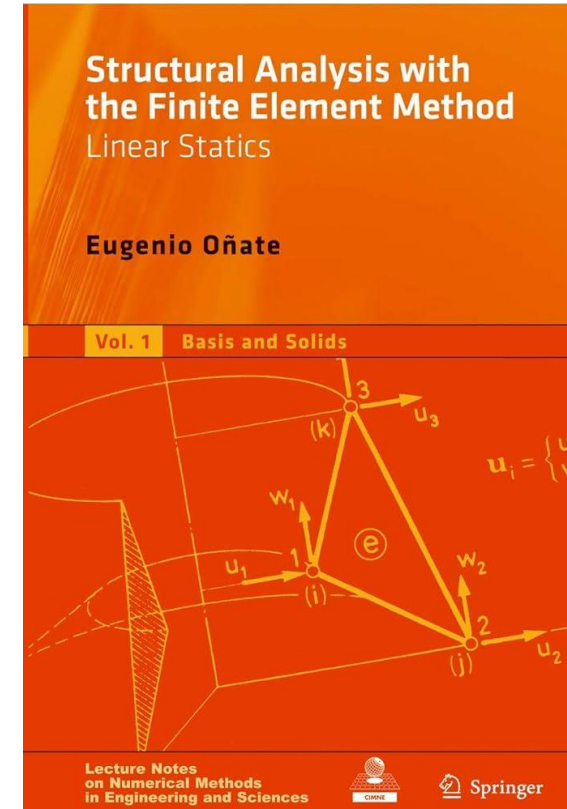# Introduction to Structural Analysis & Python Implementation
Subtitle

1D truss displacement problem

❖ featuring a distributed load along the truss and a point load on the free end
❖ using linear FEM basis & NURBS basis of degree p, where p+1 convergence rate was achieved

Axially loaded rod

[Eugenio Oñate, Structural Analysis with the Finite Element Method, Vol. 1]

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Introduction to C++

Subtitle

Topics

❖ Object-oriented programming concepts such as classes, member variables, methods, and private/public entities

❖ Class derivation and inheritance, virtual methods and override, polymorphism, templates, generic programming

❖ Pointers and references

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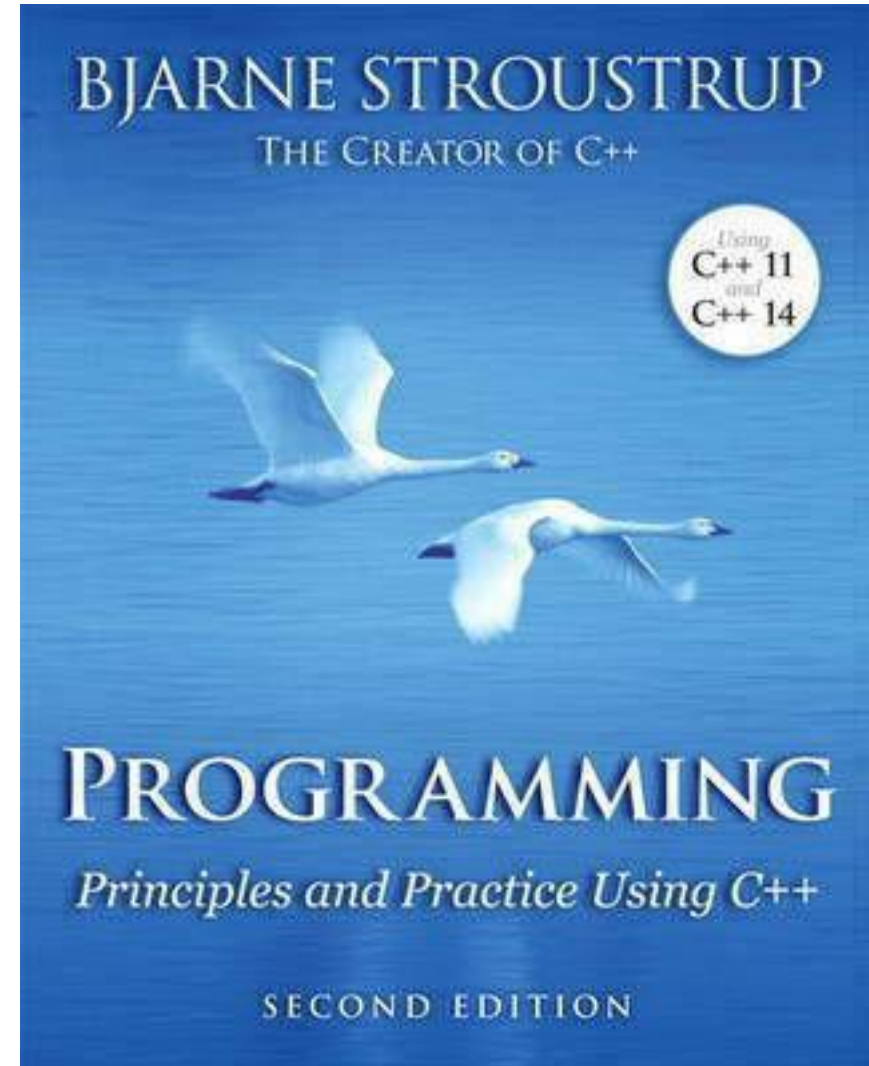
1D Isotropic Damage Model
Subtitle

❖ object-oriented Python code to calculate the behaviour of a material under the influence of strain

Oliver, Javier & Cervera, Miguel & Oller, Sergio & Lubliner, Jacob. (1990). Isotropic Damage Models and Smeared Crack Analysis of Concrete. 2

The graphical representation illustrates the stress-strain relationship during both loading and unloading phases for a material characterised by a Young's modulus (E) of 1E+08 Pa, yield stress of 2 MPa, and fracture energy of 5E+04 J/m2 is presented below
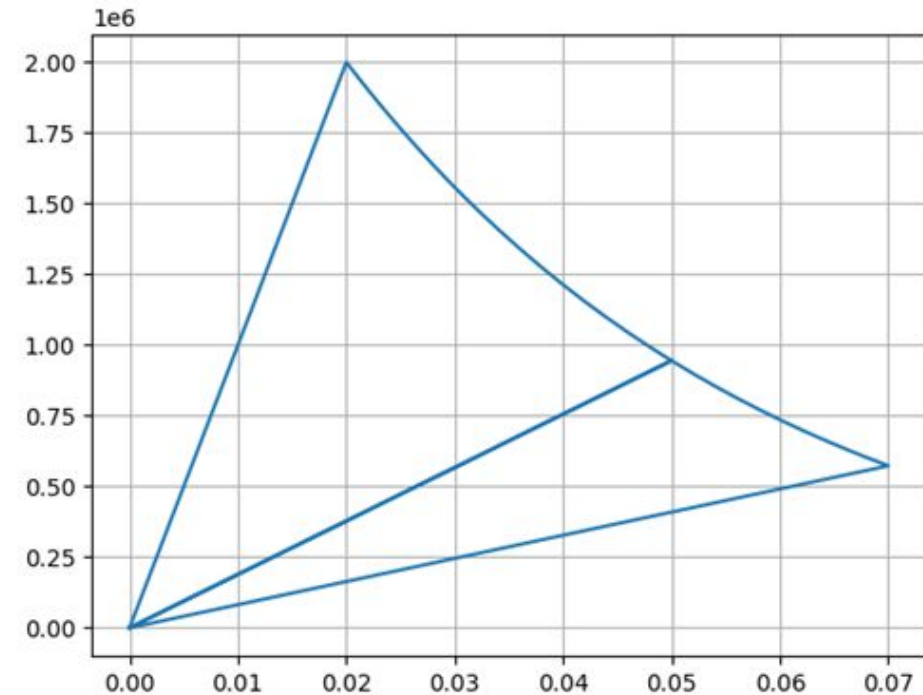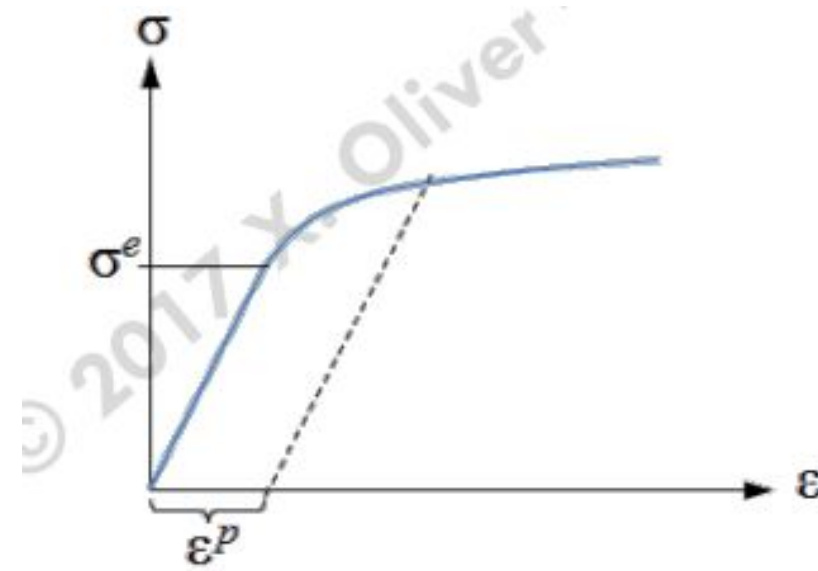

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Next steps

Subtitle

❖ **Development of 2D Isotropic Damage model**
❖ **Hyper-elasticity**
❖ **Plasticity**

Stress-strain relationship in plasticity
[Xavier Oliver, Continuum Mechanics for Engineers, Multimedia Course]

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Thank you!

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