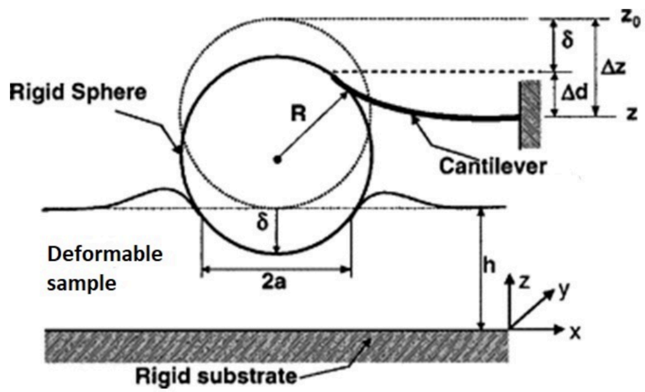
UNIVERSITÀ DEGLI STUDI DI MILANO

Bachelor/Master Thesis project

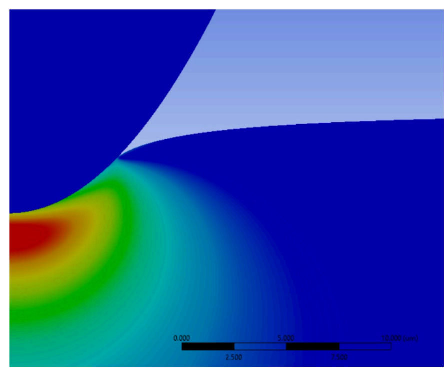
Characterization of the mechanical response of spatially confined elastic films

Physical boundaries (finite thickness, lateral confinement etc.) strongly influence the mechanical response of elastic systems subject to an external stress, hampering the accurate characterization of their elastic properties (such as the modulus of elasticity, i.e., the stress-strain proportionality factor). Atomic Force Microscopy (AFM) and related nanoindentation techniques allow to accurately measure the elastic properties of soft matter system at the micro and nanoscale, nevertheless specific measures must be adopted to account for the effects of the spatial constraints. In this project the student will develop experimental and data analysis strategies to account for the finite dimensions' effects; the work will include fabrication of suitable AFM probes and soft samples with micrometric dimensions, nanoindentation measurements by AFM, application of contact mechanics models and finite element simulation for the data analysis.

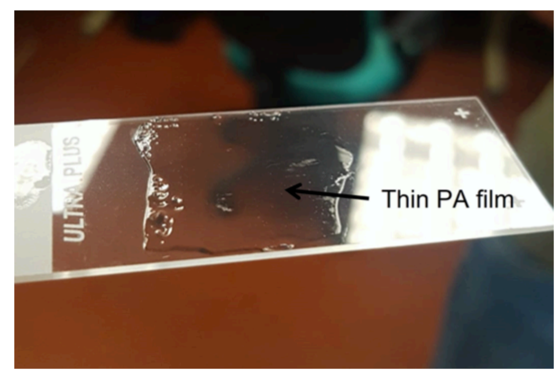
Dal Fabbro et al., arXiv, DOI: https://doi.org/10.48550/arXiv.2406.17157,
Biophys. Jour. 82, 2798-2810 (2002), DOI: 10.1016/S0006-3495(02)75620-8
Eur. Jour. Phys. 42, 025010 (2021), DOI: 10.1088/1361-6404/abccfb, Puricelli et al., RSI 86, 033705 (2015). DOI: 10.1063/1.4915896



Nanoindentation of a finite thickness elastic film



Finite Elements Analysis (FEA)



A soft gel with a thickness gradient

See also

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