

Sala Affreschi
Facoltà di Ingegneria Civile e
Industriale
venerdì 25 luglio 2025
Ore 12.00



Research in Total Knee Arthroplasty Biomechanics: Closing the Gap between Surgeons and Engineers

Seminar Lecture

prof. Bernardo Innocenti PhD

Abstract

Knee kinematics is a complex three-dimensional roto-translation strongly influenced by patient-specific anatomy, including the femoral condyles, tibial plateau, patellar surface, and soft tissue morphology and mechanics. As each individual exhibits unique kinematics and kinetics, understanding patient-specific joint anatomy and function—through dedicated experimental and computational methodologies—is essential to bridge the gap between surgeons and engineers in total knee arthroplasty (TKA). Evidence consistently shows that knee biomechanics is highly patient-dependent. Even minor deviations in implant positioning or soft tissue modelling can induce substantial changes in joint forces—sometimes up to 60%—despite only small kinematic alterations. Patient-specific experimental and computational approaches thus emerge as promising tools to guide surgeons and engineers in optimizing TKA outcomes and restoring mobility.



Bernardo Innocenti is Professor of Biomechanics at the BEAMS Department of the Université Libre de Bruxelles (ULB), Belgium, since 2012. From 2007 to 2012, he served as Lead Project Manager at the European Centre for Knee Research, Smith & Nephew, in Leuven, Belgium. At ULB, he was appointed Associate Professor in 2012 and promoted to Professor in 2020. Since 2011, he has also been a Guest Professor in the Division of Biomechanics, Department of Mechanical Engineering, KU Leuven, Belgium. Since 2022, he has served as President of the Biomedical Filière at ULB. His main research focus is orthopaedic biomechanics, particularly the numerical and experimental analysis of the human knee joint in native, pathological, and prosthetic conditions. Prof. Innocenti is a member of the Council of the European Society of Biomechanics (since 2022), the founding President of the Belgian Chapter of the International Society for Computer-Assisted Orthopaedic Surgery (CAOS Belgium, 2015), and a member of the European Knee Society (2016), the European Society of Sports Traumatology, Knee Surgery and Arthroscopy (2016), and the European Knee Associates (2018). He has received several awards, including the Marc Coventry Award (2009) and the Richard S. Laskin Research Award (2011). Prof. Innocenti is also a consultant for several orthopaedic companies.

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