



# SEMINAR

## Young Researchers in Mechanical Engineering



### Advancing Soft Transducers for Dexterous Robotics

#### SPEAKER

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#### ABSTRACT

Soft transducers are emerging as key complementary components in the development of next-generation robotic systems. Enhancing their performance while preserving their inherent compliance presents challenges. This talk will explore strategies for advancing soft transducers toward the level of dexterity and adaptability seen in the human hand.

One approach leverages shape memory polymers that remain soft and compliant during active operation but transition to a rigid state when mechanically latched. These materials are integrated with various soft actuation mechanisms, including pneumatic systems, dielectric elastomers, and soft electromagnetic actuators, and have been demonstrated in applications such as microfluidic valve arrays and reconfigurable robotic grippers.

Another focus is on mechanical amplification techniques using electroadhesion, which offers a fast, high force-density method for accumulating small, high-frequency displacements and distributing actuation power across multiple outputs. This capability makes electroadhesion particularly well-suited for complex, highly dexterous systems such as robotic hands.

Finally, the talk will highlight the critical importance of integrating soft sensors for robust, closed-loop control. Their deformable nature introduces distinct challenges, including vulnerability to electromagnetic interference, particularly in soft capacitive sensors operating near electronic components or external conductive objects. Conventional mitigation strategies such as electromagnetic shielding are often incompatible with soft and flexible systems, emphasizing the need for novel approaches to ensure reliable sensing performance in real-world, unstructured environments.

#### ABOUT THE SPEAKER

Bekir Aksoy is a Research Associate at Northwestern University's Center for Robotics and Biosystems. He earned his PhD from EPFL in Switzerland, where he focused on shape-programmable, multi-stable polymer actuators. He holds MSc and BSc degrees from Koç University, where his research centered on MEMS-based traction sensors for cellular biomechanics. Bekir's research spans soft actuation, multi-stable materials, microfluidics, MEMS, and soft force sensing. He has been actively involved in interdisciplinary projects with both academic and industrial collaborators. His current work is directed toward developing high-performance actuation systems for dexterous robotic and haptic applications.



#### ZOOM DETAILS

<https://zoom.us/j/2837443344?pwd=NnZJaEpwQklJdUlxNGZtcFhRY0Rjdz09&omn=94719948246>

Meeting ID: 283 744 3344. Passcode: 2354290

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