**OBJECTIVE**

Establish analytically the scaling law for shear-enhanced transfer printing
Optimize the design parameters in the process of transfer printing for stretchable and flexible electronics
Enable a **cost-effective** fabrication and pave the way for potential commercialization

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**Shear-Enhanced Transfer Printing**

Adhesion Retrieval:
- $\Gamma_1$ (stamp, ink, donor)
- $\Gamma_2$

Printing:
- $\Gamma_1$' (receiver)
- $\Gamma_3$

Conventional: $\Gamma_2 > \Gamma_1' = \Gamma_2 > \Gamma_1$
Shear-enhanced: $\Gamma_2 > \Gamma_1' << \Gamma_2 > \Gamma_1$

**Continuous Roll-to-Roll Application**

Pickup
(a) Forward rolling
(b) Backward rolling
(c) High adhesion, slow rolling speed
(d) Low adhesion, fast rolling speed

Different adhesion strengths depend on the rotating direction

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**Design Problem in Roll-to-Roll Application**

Design Objective: Maximum pull-off $F_{max}$, given post height $h$, width $L$

Design Variable: Inclined angle $\theta$

**Uncertainty Quantification & Optimization**

Modular Bayesian Approach: $y^e(x) = y^{in}(x, \theta) + \delta(x) + \varepsilon$

1. UQ for vertical post
2. UQ for angled post
3. Optimization