Showcasing research from Shengyu Tao, Ruohan Guo and Jaewoong Lee from Tsinghua, PolyU and Berkeley.

Immediate remaining capacity estimation of heterogeneous second-life lithium-ion batteries *via* deep generative transfer learning

Assessing the remaining capacity of retired lithium-ion batteries is essential for unlocking their second-life potential in under-resourced regions. However, this process is hindered by data scarcity and heterogeneity. This work proposed a deep generative transfer learning that can synthesize realistic pulse voltage response and align heterogeneous data domains without requiring historical records. The approach achieves high prediction accuracy with minimal field data, outperforming existing learning methods. It offers a scalable, data-efficient pathway toward sustainable, cost-effective battery repurposing and supports equitable energy transitions in the circular economy.

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As featured in:

See Scott Moura, Guangmin Zhou, Jinpeng Tian, Xuan Zhang *et al.*, *Energy Environ. Sci.*, 2025, **18**, 7413.

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