Relative Trace Formula and $L$-functions for $\text{GL}(n+1) \times \text{GL}(n)$

**Abstract:** We will introduce a relative trace formula on $\text{GL}(n+1)$ weighted by cusp forms on $\text{GL}(n)$ over number fields. The spectral side is an average of Rankin–Selberg $L$-functions for $\text{GL}(n+1) \times \text{GL}(n)$ over the full spectrum, and the geometric side consists of Rankin–Selberg $L$-functions for $\text{GL}(n) \times \text{GL}(n)$, and certain explicit meromorphic functions. The formula yields new results towards central $L$-values for $\text{GL}(n+1) \times \text{GL}(n)$: the second moment evaluation, and simultaneous nonvanishing in the level aspect. Further applications to the subconvexity problem will be discussed if time permits.