

**March 27, 2023**  
**2:00pm-3:00pm**  
**KAP 414**

**Prof. Yu-Jui Huang**  
**(University of Colorado, Boulder)**

**Convergence of Policy Improvement**  
**for Entropy-Regularized Stochastic Control Problems**

**Abstract:** For a general entropy-regularized stochastic control problem on an infinite horizon, we prove that a policy improvement algorithm (PIA) converges to an optimal relaxed control. Contrary to the standard stochastic control literature, classical Hölder estimates of value functions do not ensure the convergence of the PIA, due to the added entropy-regularizing term. To circumvent this, we carry out a delicate estimation by moving back and forth between appropriate Hölder and Sobolev spaces. This requires new Sobolev estimates designed specifically for the purpose of policy improvement and a nontrivial technique to contain the entropy growth. Ultimately, we obtain a uniform Hölder bound for the sequence of value functions generated by the PIA, thereby achieving the desired convergence result. Characterization of the optimal value function as the unique solution to an exploratory Hamilton-Jacobi-Bellman equation comes as a by-product.

**Zoom Link:** USC Math Finance Colloquium  
Time: Mar 27, 2023 02:00 PM Pacific Time (US and Canada)

Join Zoom Meeting  
<https://usc.zoom.us/j/93185392412?pwd=MEdxLzFCMTFKU2pZOURXY1dFd1J2dz09>

Meeting ID: 931 8539 2412  
Passcode: 117947