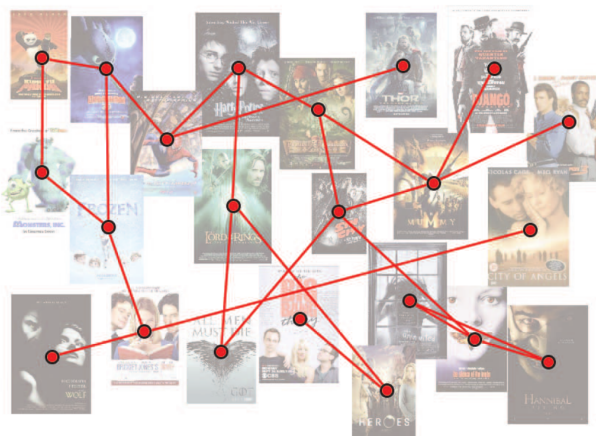


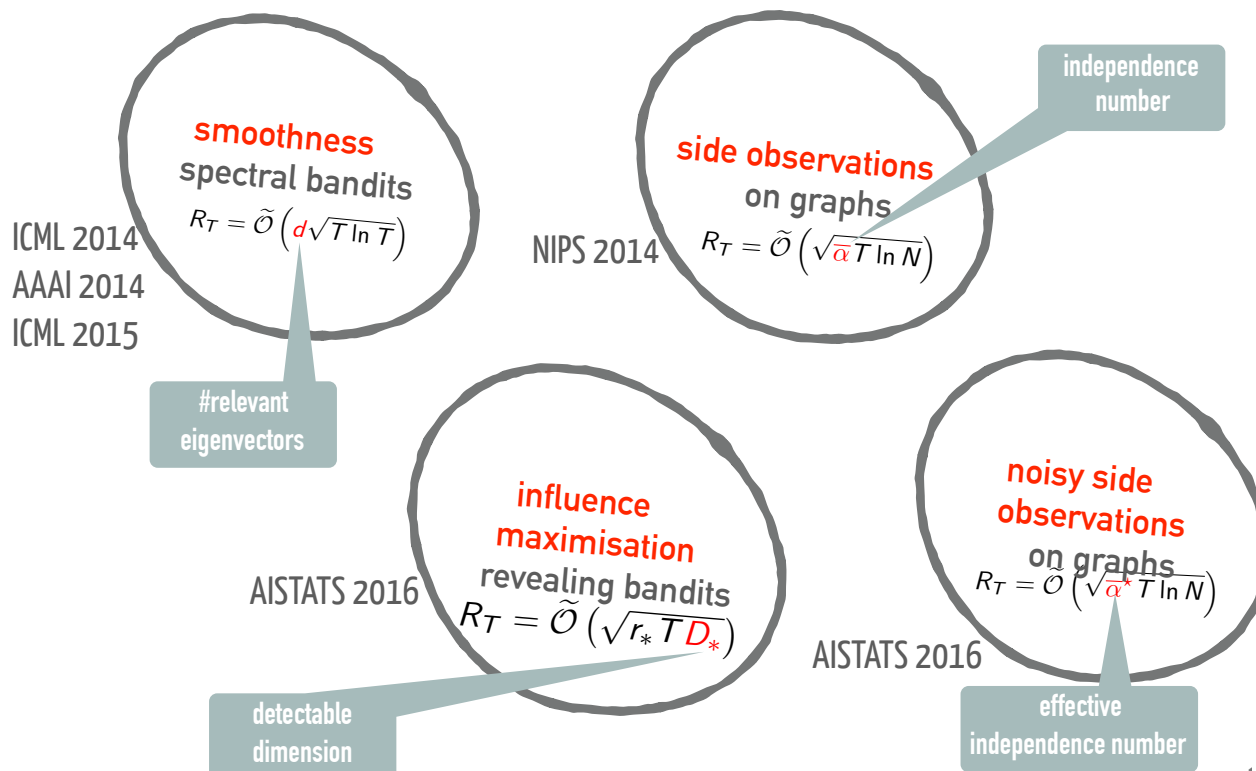
LEARNING FASTER WITH GRAPHS, MICHAL VALKO



Graph Bandits



- ▶ Sequential problems where decisions are graphs nodes
recommendation systems, advertising, sensor and social networks
- ▶ Ignoring the structure gets high error $R_T = \mathcal{O}(\sqrt{NT})$
- ▶ Independence between the decisions is too strong and unnecessary
- ▶ **Agenda:** strategies that replace N with a **smaller** graph-dependent quantity



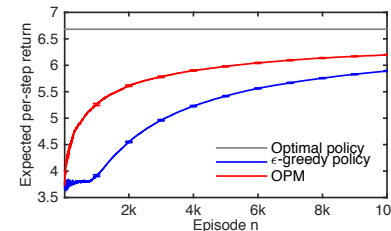
Examples of usage

- ▶ **Smoothness** in rewards
 - ▶ similar movies give similar rewards
- ▶ **Side observations**
 - ▶ extra info for items (camera → SD card)
 - ▶ extra feedback from social contacts
 - ▶ extra (noisy) sensor readings
- ▶ **Influence maximisation**
 - ▶ find influential nodes to target

SEQUENTIAL LEARNING IN OTHER STRUCTURES

▶ Matroid and polymatroid bandits

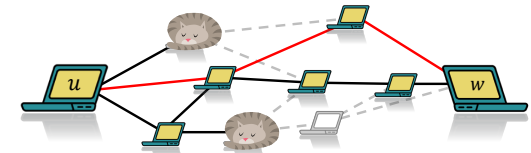
- ▶ **Diverse** set of recommendations (JMLR 2016)



Movie title	Movie genres
American Beauty	Comedy Drama
Jurassic Park	Action Adventure Sci-Fi
Saving Private Ryan	Action Drama War
Matrix	Action Sci-Fi Thriller
Fargo	Crime Drama Thriller
Shakespeare in Love	Comedy Romance
L.A. Confidential	Crime Film-Noir Mystery Thriller
E.T.	Children's Drama Fantasy Sci-Fi

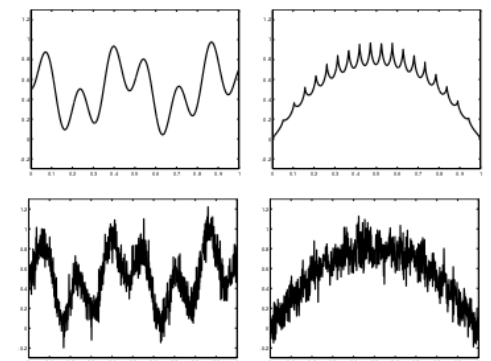
▶ General combinatorial bandits

- ▶ Efficient online learning (ongoing work)
- ▶ Sleeping bandits (**missing items** in the stocks, SleepingCAT, NIPS 2014)



▶ Continuous bandits

- ▶ Optimistic **function** optimisation (StoS00, P00, ICML 2013, CEC 2014, NIPS 2015)
- ▶ Infinitely many bandits with no topology (SiRI, ICML 2014)



▶ Extreme bandits

- ▶ Hunting for **outliers** (ExtremeHunter, NIPS 2014)