

SYLLABUS

Module 5 Technology diffusion, firms' survival and knowledge Sharing (PhD Program in Economics and Statistics (Track in Data Science for Business))

Marco Guerzoni

This module aims at exploring data science as a tool for the economics and management of innovation and technological change. Each class, after a short theoretical introduction, shows with real-data how different families of data science algorithms can enrich knowledge about specific issues in innovation studies. Each class is also conceived as a hands-on collective work with data application with R. We apply three data science techniques to some classic problems in the field: prediction for technology diffusion and firms' survivals, network analysis for mapping knowledge flows, and text mining for capturing knowledge trends with patent data and journal articles.

Part 1

1. Explaining Technology Diffusion. Method: econometrics.
2. Predicting and Explaining Start-up Survival. Method: machine learning.

Part 2

3. Knowledge Network within a firm. Method: Network Analysis.

Part 3

4. Inter-organizations firm flows. Method: Text mining.

Readings

Part 1. Predicting technology diffusion and firms' survival

Rogers, Everett M. "A prospective and retrospective look at the diffusion model." *Journal of health communication* 9.S1 (2004): 13-19. (*)

Rogers, E. M. 1962. *Diffusion of innovations*, New York: Free Press. (chapter 1, 6, 7) (*)

Bargagli-Stoffi, F.J., Niederreiter, J. and Riccaboni, M., 2021. Supervised learning for the prediction of firm dynamics. In *Data Science for Economics and Finance* (pp. 19-41). Springer, Cham. (*)

Hyytinen, Ari, Mika Pajarinen, and Petri Rouvinen. "Does innovativeness reduce startup survival rates?." *Journal of business venturing* 30.4 (2015): 564-581. (*)

Guerzoni, M., Nava, C. R., & Nuccio, M. (2021). Start-ups survival through a crisis. Combining machine learning with econometrics to measure innovation. (*)

Part 2. Network analysis for mapping knowledge flows

Velyka, A., & Guerzoni, M. (2020). Velyka, Anna, and Marco Guerzoni. "The more you ask, the less you get: the negative impact of collaborative overload on performance." *arXiv preprint arXiv:2004.13545* (2020). (*)

Cantner, Uwe, and Holger Graf. "The network of innovators in Jena: An application of social network analysis." *Research policy* 35.4 (2006): 463-480. (*)

Ter Wal, Anne LJ, and Ron A. Boschma. "Applying social network analysis in economic geography: framing some key analytic issues." *The Annals of Regional Science* 43.3 (2009): 739-756. (*)

Part 3. Text mining and knowledge trends

Blei, David M., and John D. Lafferty. "Topic models." *Text mining*. Chapman and Hall/CRC, 2009. 101-124. (*)

Suominen, Arho, Hannes Toivanen, and Marko Seppänen. "Firms' knowledge profiles: Mapping patent data with unsupervised learning." *Technological Forecasting and Social Change* 115 (2017): 131-142. (*)

Ambrosino, Angela, et al. "What topic modeling could reveal about the evolution of economics." *Journal of Economic Methodology* 25.4 (2018): 329-348. (*)