

# Mapping Firms' Locations in Technological Space: A Topological Analysis of Patent Statistics\*

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September 1, 2020

## Abstract

We propose a new method to characterize firms' inventive activities via topological data analysis (TDA) that represents high-dimensional data in a shape graph. Applying this method to 333 major firms' patent portfolios in 1976–2005 reveals substantial heterogeneity: some remain undifferentiated, whereas others develop unique portfolios. Firms with unique trajectories, which we define graph-theoretically as “flares” in the Mapper graph, perform better. This association is statistically and economically significant, and continues to hold after controlling for portfolio size and firm survivorship. Comparison with existing techniques suggests the method's usefulness for data visualization, feature selection, and exploratory empirical research more generally.

*Keywords:* Innovation, Mapper, Patents, R&D, Topological data analysis.

*Journal of Economic Literature (JEL) classifications:* C65, C88, L10, O30.

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\*For helpful discussions and comments, we thank Susan Athey, Iain Cockburn, David Hsu, and Adam Jaffe, as well as participants at Yale University Industrial Organization Seminar, the *NBER Innovation Information Initiative* meeting 2019, *Joint Conference on Applied Mathematics 2019* by the Mathematical Society of Japan's (MSJ) Research Section of Applied Mathematics, *MSJ Spring Meeting 2020*, Kyoto University Applied Mathematics Seminar, *TDA for Applications - Tutorial & Workshop* at Tohoku University, and the *Econometric Society World Congress 2020*. We thank Alan Chiang and Chise Igami for research assistance, and the National Institute of Science and Technology Policy (NISTEP) of Japan for providing an occasion for Hiraoka and Igami to meet in 2017. Part of this research was conducted while Igami was visiting MIT's Department of Economics, which he thanks for hospitality.

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