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Digital Image Analysis using Persistent Homology and Machine Learning**Ippei Obayashi¹***¹Advanced Institute for Materials Research(WPI-AIMR), Tohoku University*

In this poster presentation, I will show you methods of digital image analysis using persistent homology and machine learning. Persistent homology enables us to describe the shape of data quantitatively from the viewpoint of homology and it is useful to study heterogeneous geometric structures. Machine learning enables us to detect characteristic patterns behind data. By the combination of persistence homology and machine learning, we can quantitatively and statistically find characteristic geometric pattern hidden behind the data. Persistence Image[1] and linear machine learning models are used for our methods. This combination gives us a very intuitive visualization of the learned result. “Inverse Problem” techniques for persistence diagrams are also effectively used to visualize the learned result. X-CT images of iron ore sinter are analyzed using the method.

This research is a joint work with M. Kimura (KEK) and Y. Hiraoka (WPI-AIMR, Tohoku Univ.).

[1] Persistence Images: A Stable Vector Representation of Persistent Homology, Henry Adams, Tegan Emerson, Michael Kirby, Rachel Neville, Chris Peterson, Patrick Shipman, Sofya Chepushtanova, Eric Hanson, Francis Motta, and Lori Ziegelmeier; Journal of Machine Learning Research 18(8):1–35, 2017.

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