Spectral Clustering using Expert Knowledge[1] C. TYLER DIG-
GANS, Air Force Research Lab: Information Directorate — We present results
from an application of spectral clustering in which an algorithmically defined simi-
larity measure is used in the domain of space object tracking. The current literature
generally uses Gaussian kernels, which are well suited for Euclidean spaces, but the
techniques could be more widely implemented in novel applications where expert
knowledge and heuristics are required. Defining an algorithmic similarity measure
allows such knowledge to be incorporated, which can be useful in a wide set of con-
texts. We show results for classifying space observations by object and present some
theoretical justifications for its use. Advances in spectral clustering are utilized such
as the use of a diffusion map to determine a low dimensional Euclidean represen-
tation of the data, which retains the non-linear associations, along with self-tuning
parameters and the use of a local scaling to enhance results. Overall, this is meant
to be an introduction to a set of classification tools through an example application.

[1]Space Operations Initiative

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