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Quantifying morphological differences between seemingly similar systems of self-assembled planar particles to evaluate the influence caused from varying experimental methods in order to achieve better control over producing patterns with a desired intermolecular structure and dispersion

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One of the many challenges for nanoscale engineering is to purposely direct the self-assembly of nanomaterials into desired patterns. Easy deposition methods (such as drop-casting) are preferable over ones that require high-vacuum (such as thermal deposition), as the latter has a high cost and requires long processing time; both of which renders the method infeasible for mass production. The trade-off for ease-of-use fabrication is that intermolecular morphology of the nano-objects are likely to have some uncontrollable variation between experimental outcomes, resulting in disordered states. To achieve desired patterns, researchers rely on trial-and-error methods to understand which experimental parameters have the necessary influence on morphology. However, in systems of similar density, human perception is unable to detect subtile differences in the localized structure, which can lead to misclassifications in the amount and type of disorder in the system. In this talk, we'll explore numerical methods where in which these disordered states can be quantified and ranked between each other when the preparation method for nanoparticle deposition at the interface is varied. This allows researchers to quickly and confidently decide the next variation in methodological refinement by rejecting unnecessary experiments. These analysis tools have been developed as a Mathematica package and are made freely available to use. The only requirement for using these tools is knowing the relative positions of the objects, which can be extracted from imaging techniques (such as AFM or SEM).

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