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3-manifolds in the 4-sphere

This project was born out of the observation that there's not many papers in the literature that have results on which 3-manifolds admit smooth embeddings into the 4-sphere. For some families of 3-manifolds there are strong results, namely manifolds that fibre over a surface, and also for homology spheres. But for many other families of 3-manifolds there are few results on "both sides": namely, lack of computable embedding obstructions, and lack of useful embedding constructions. I have been working through the Burton/Martelli/Matveev/Petronio census of prime 3-manifolds that admit (semi-simplicial) triangulations with 11 or less tetrahedra. There's 13400 closed orientable manifolds in the list. As I write this abstract, 19 of the 13400 manifolds in the list are known to embed, and there's only 94 manifolds in the list for which it is not known if they embed (and only 34 of the 94 have trivial JSJ-decompositions). I will briefly describe the methods to compile this data: the computer software used, obstructions to embeddings and how they are computed, and techniques to construct embeddings. I hope to highlight some of the pleasant aspects of the data, including patterns in the data that could give reasonable conjectures for some families of 3-manifolds.