

## **Uber Ultrafilters: A Rigorous Treatment of Infinitesimals**

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Development of the calculus relied heavily on the poorly defined notion of an infinitesimal. These ideal numbers were used, with and without success, for many years until real analysis was made rigorous through epsilons and deltas. As a result of this formalization, infinitesimals became an intuitive concept used to help explain calculus. During the 1960s, Abraham Robinson found a way to make infinitesimals a well defined tool for mathematicians. Since then, a simpler method of developing infinitesimals for the real numbers was found. I will present a rigorous construction following the more recent method, which uses ultrafilters, and prove some standard results in calculus using infinitesimals.

### **References:**

Hoskins, R.F. 1990. "Standard and Nonstandard Analysis: Fundamental Theory, Techniques and Applications." Chichester: Ellis Horwood Ltd.

Robinson, Abraham. 1966 "Non-Standard Analysis." Amsterdam: North-Holland Publishing Company.