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# Cities as Organisms: Allometric Scaling of Urban Road Networks

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## Abstract

We propose a statistical approach to determine the features of urban road networks affecting accessibility. Our approach is inspired by metabolic scaling theory (MST) in biology (West et al. 1997).

We study the structure of road networks across 425 cities of different sizes in the USA. We show decentralization as an important difference between urban road networks and biological vascular networks. Per capita road capacity is independent of the spatial extent of cities. Driving distances do depend on the size of the city, although not as much as is predicted by a completely centralized model. This intermediate pattern between centralized and decentralized extremes may reflect a mixture of different travel behaviors.

The approach presented here offers a novel macroscopic perspective on the differences between small and large cities and on how the road infrastructure and traffic might change as cities grow.

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