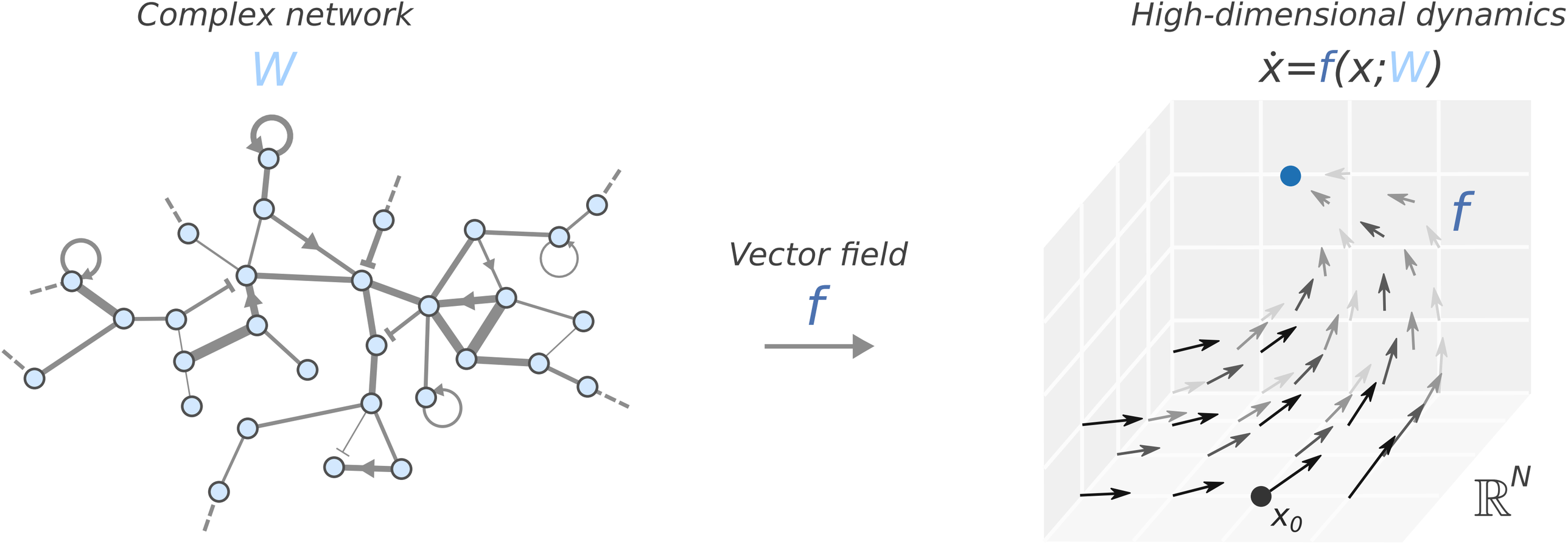

Complex network
W
Vector field
f
High-dimensional dynamics
ẋ=f(x;W)
f
x0
ℝN

Modeling the dynamics of complex systems

High-dimensional dynamics are hard to analyze and extracting meaningful intuitions from them is difficult.

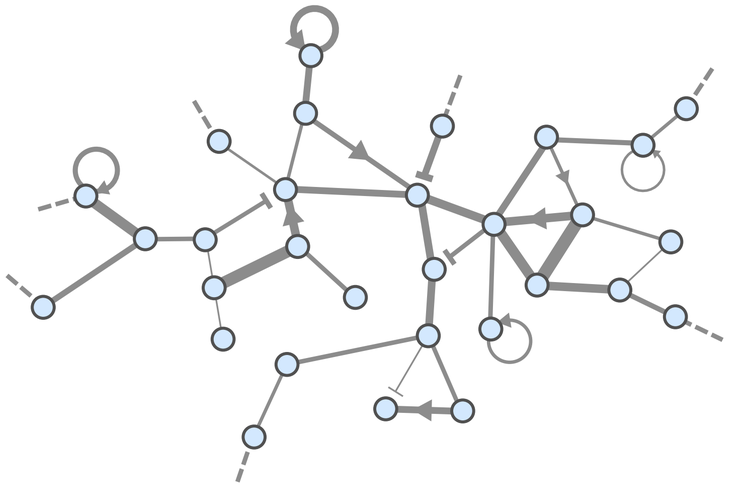
Most mathematical models involve low-dimensional representations of the networks and/or dynamical observables.

Can we justify such a low-dimensional approach beyond mathematical and/or conceptual convenience?

Modeling the dynamics of complex systems

Complex network

W

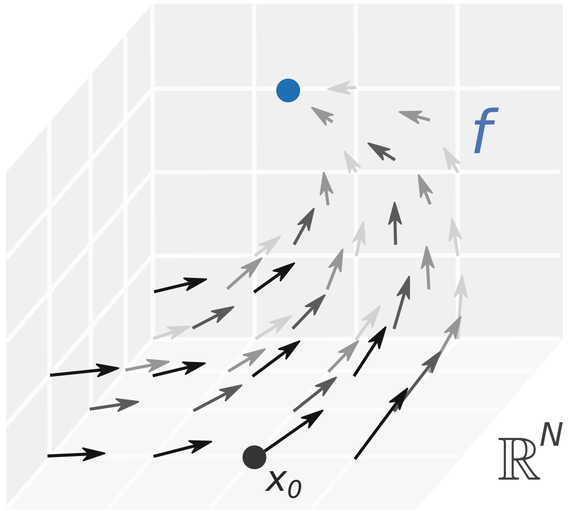


Vector field

f

High-dimensional dynamics

$\dot{x}=f(x;W)$



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The rank of adjacency matrices

Rank r of a matrix

- number of linearly independent rows/columns
- dimension of the vector space generated by its rows/columns
- number of nonzero singular values