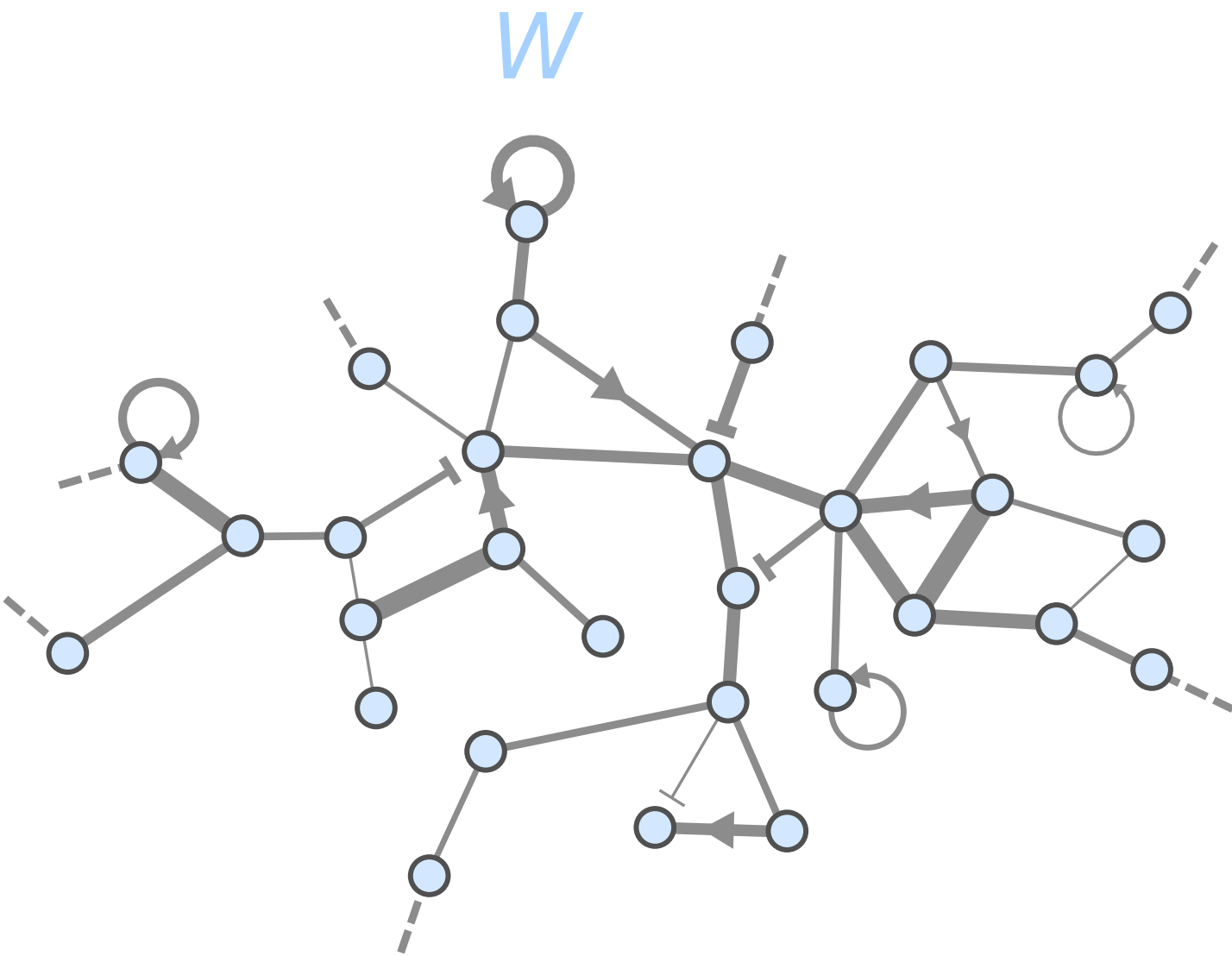


Complex network

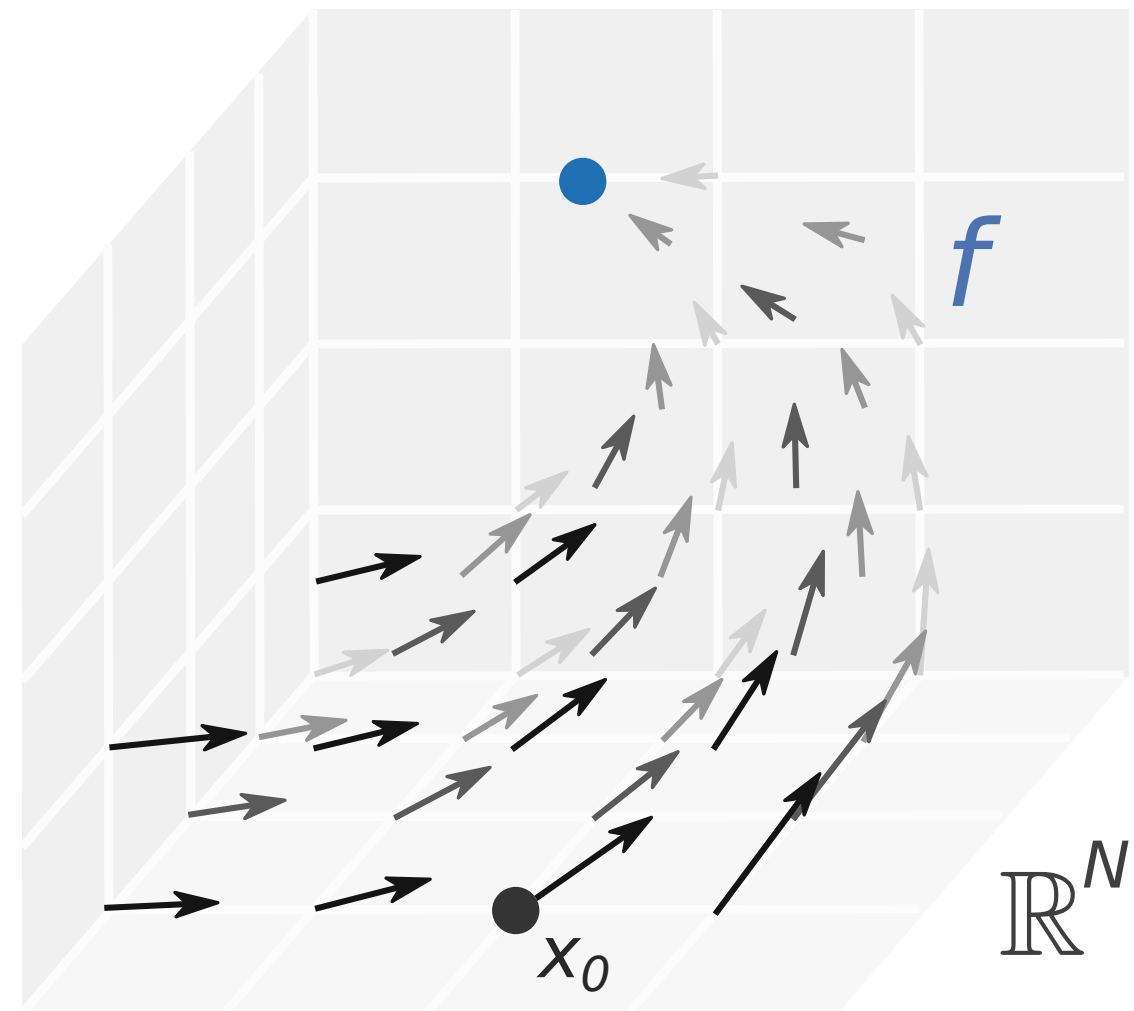


Vector field



High-dimensional dynamics

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



Modeling the dynamics of complex systems

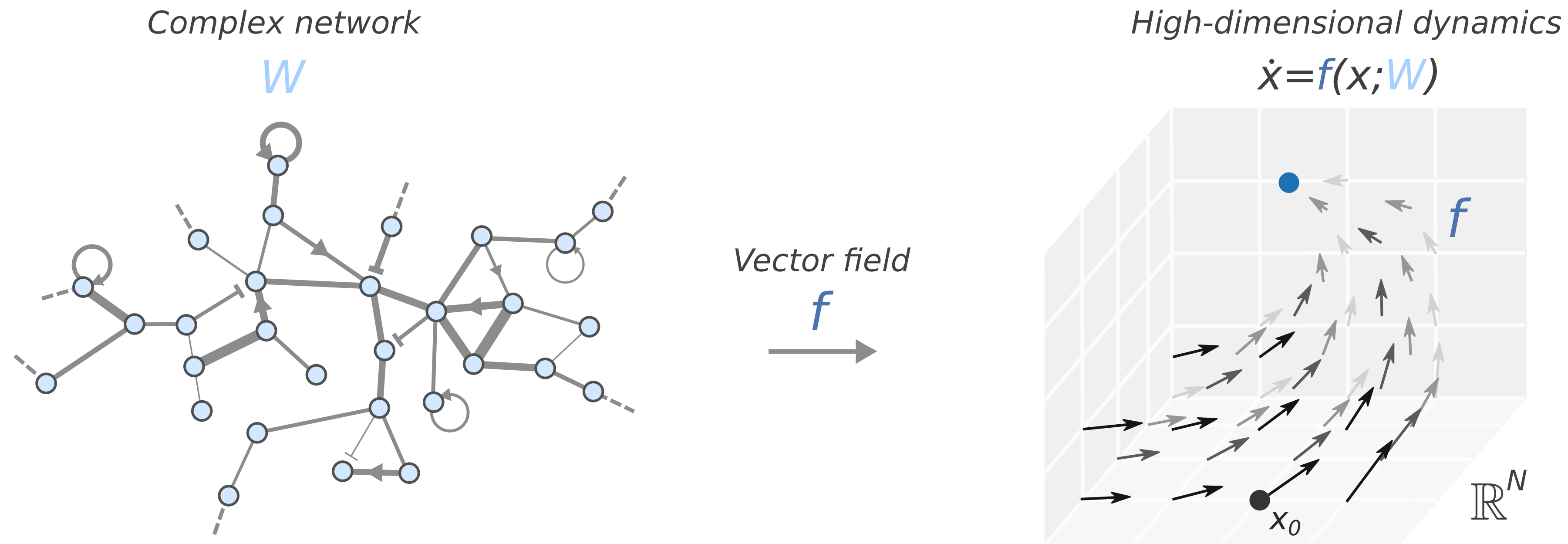
High-dimensional dynamics are hard to analyze and extracting meaningful intuitions from them is difficult.

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



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

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?

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**