Complex Model $\Rightarrow$ Rich Prior Knowledge

**Complex Generative Model**

**Example:** Grammar $\rightarrow$ sentence, Topic Model $\rightarrow$ document

**Good:** Generative models are modular $\Rightarrow$ compositional

**Bad:** Inference $\Rightarrow$ hard (non-convex) problem

**Prior Knowledge:** Model structure & priors

**Complex Word Feature Model**

**Example:** Attributes $\rightarrow$ Morphology, POS, NER, SynSet
Relations $\rightarrow$ WordNet, Ontology, Referred Object

**Good:** Rich set of features for words $\Rightarrow \gg$ constraints

**Bad:** Intractability in traditional discrete modeling

**Prior Knowledge:** Attributes and relations relevant to task
Defining Similarity allows PK Exploitation

**Kernel over Complex Data Structure**

**Example:** Similar sentences $\Rightarrow$ similar derivation (parse tree)
Similar words $\Rightarrow$ similar paths in ontology

**Relations:** Similarity $\Rightarrow$ dot product $\Rightarrow$ kernel

**Good:** Kernels are compositional (i.e. hierarchically or $\sum$)

**Bad:** Generalization issues

**Prior Knowledge:** Choosing form of structural similarity

**Just Specify a Similarity Notion and You Get:**
- Implicit inference of latent variables from input
- Implicit feature selection
- Convex (regularized) optimization problem