

Probabilistic
Graphical
Models

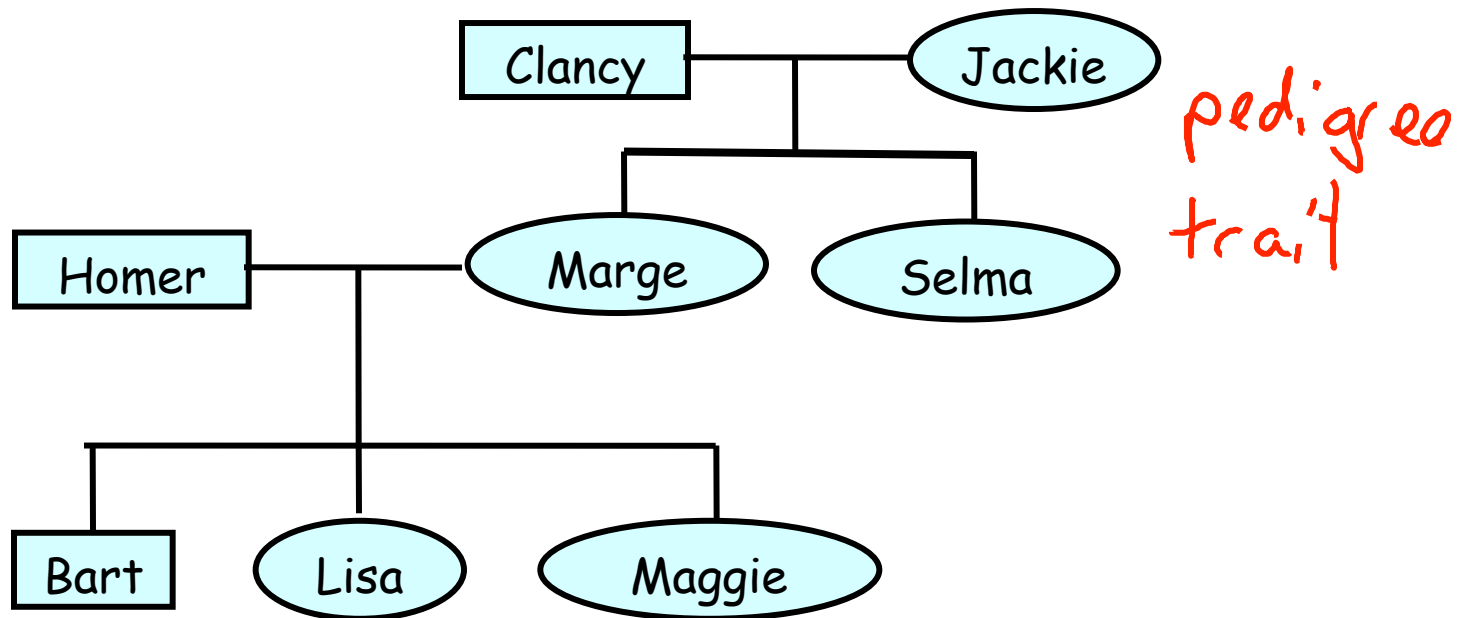


Representation

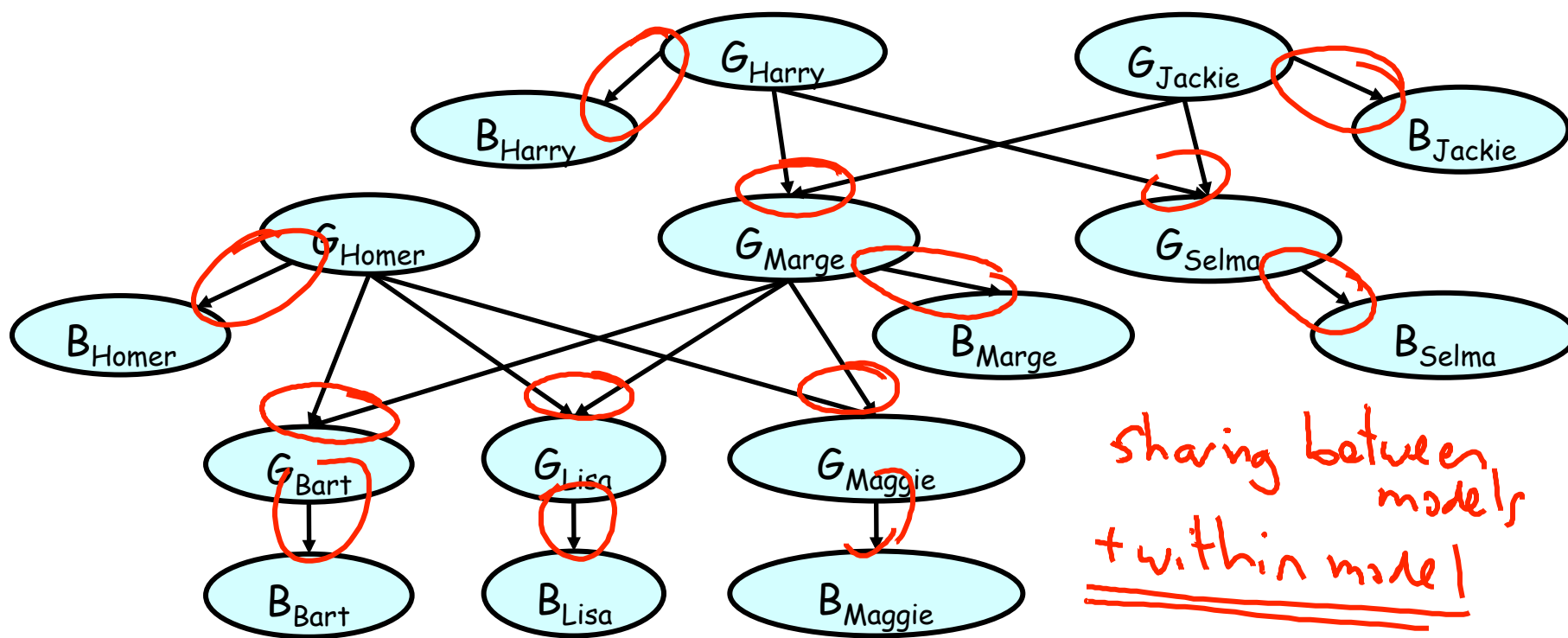
Template Models

Overview

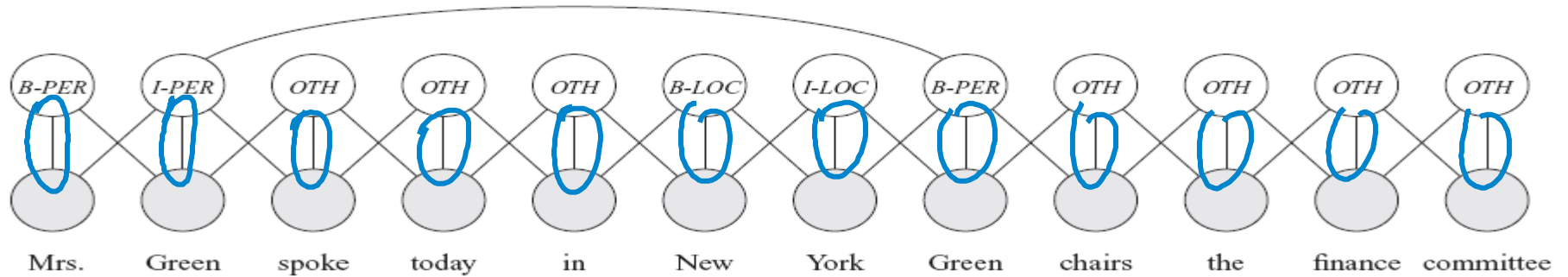
Genetic Inheritance



Genetic Inheritance



NLP Sequence Models



KEY

<i>B-PER</i>	Begin person name	<i>I-LOC</i>	Within location name
<i>I-PER</i>	Within person name	<i>OTH</i>	Not an entity
<i>B-LOC</i>	Begin location name		

Named entity recognition

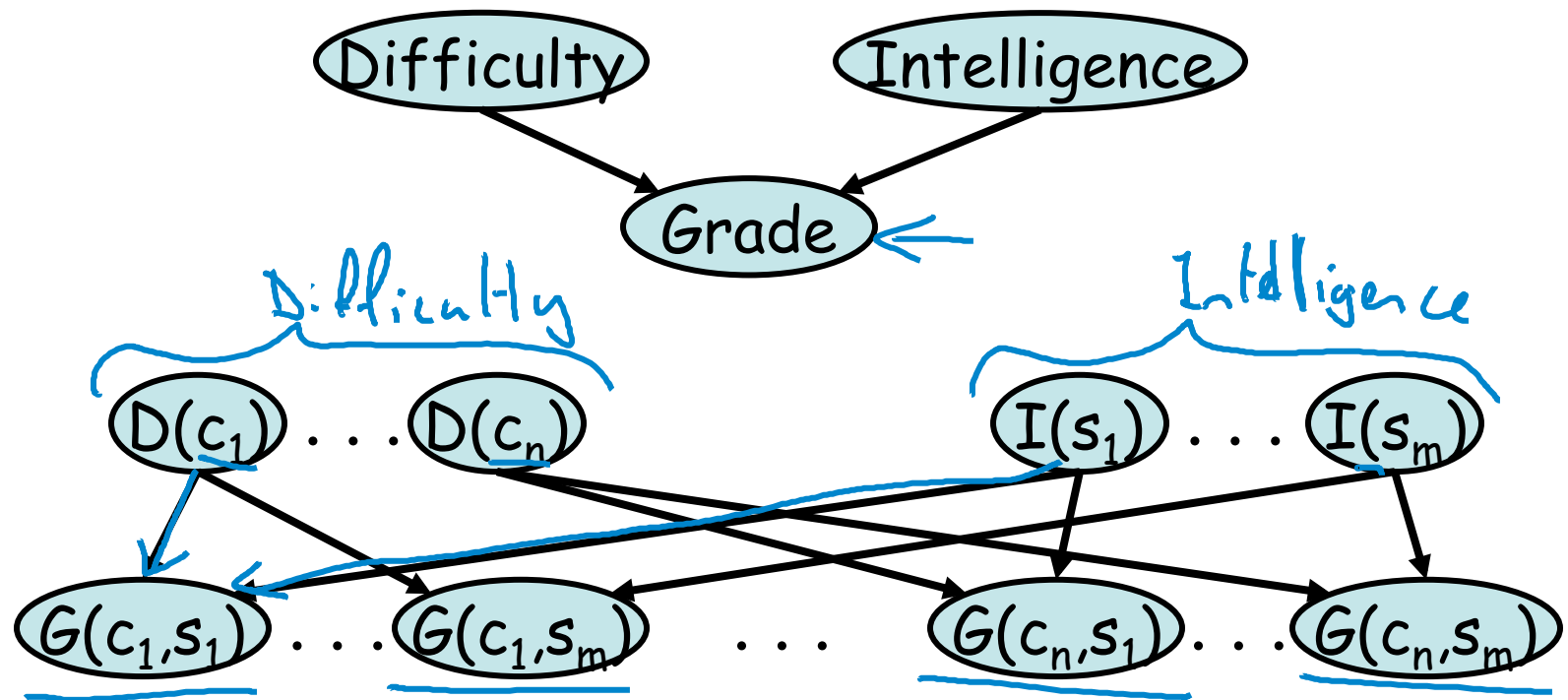
Image Segmentation

sharing across
pixel
and pairs
of super pixels



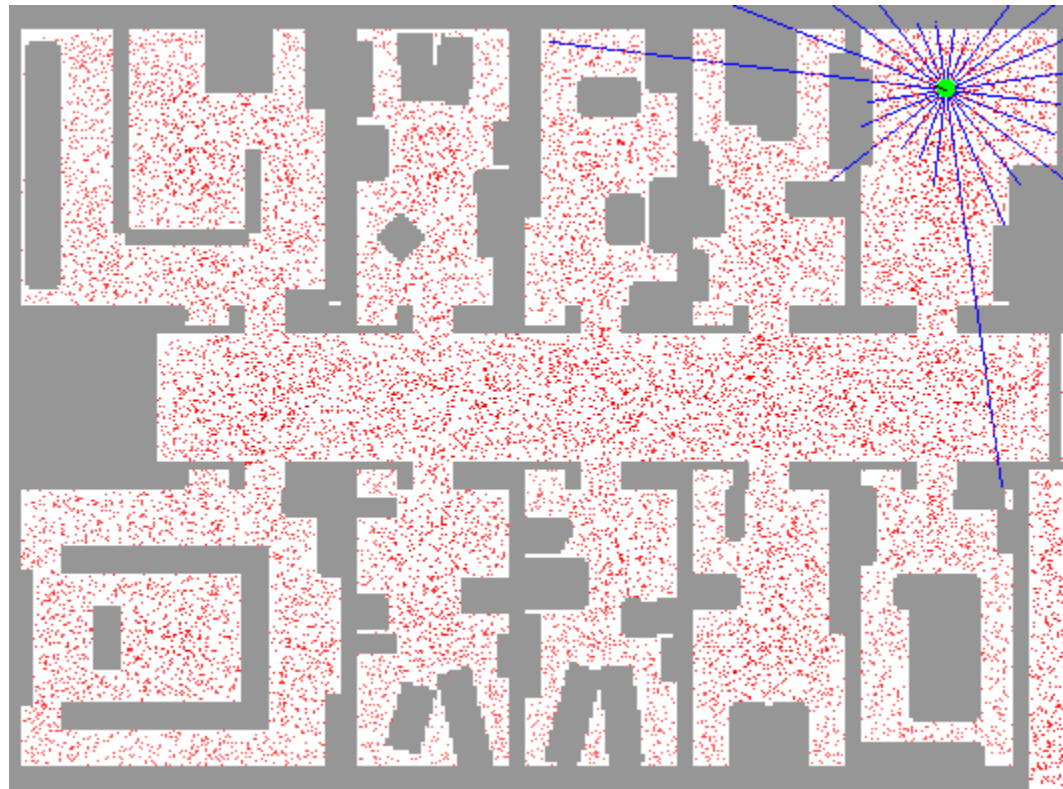
between
and
within

The University Example



Robot Localization

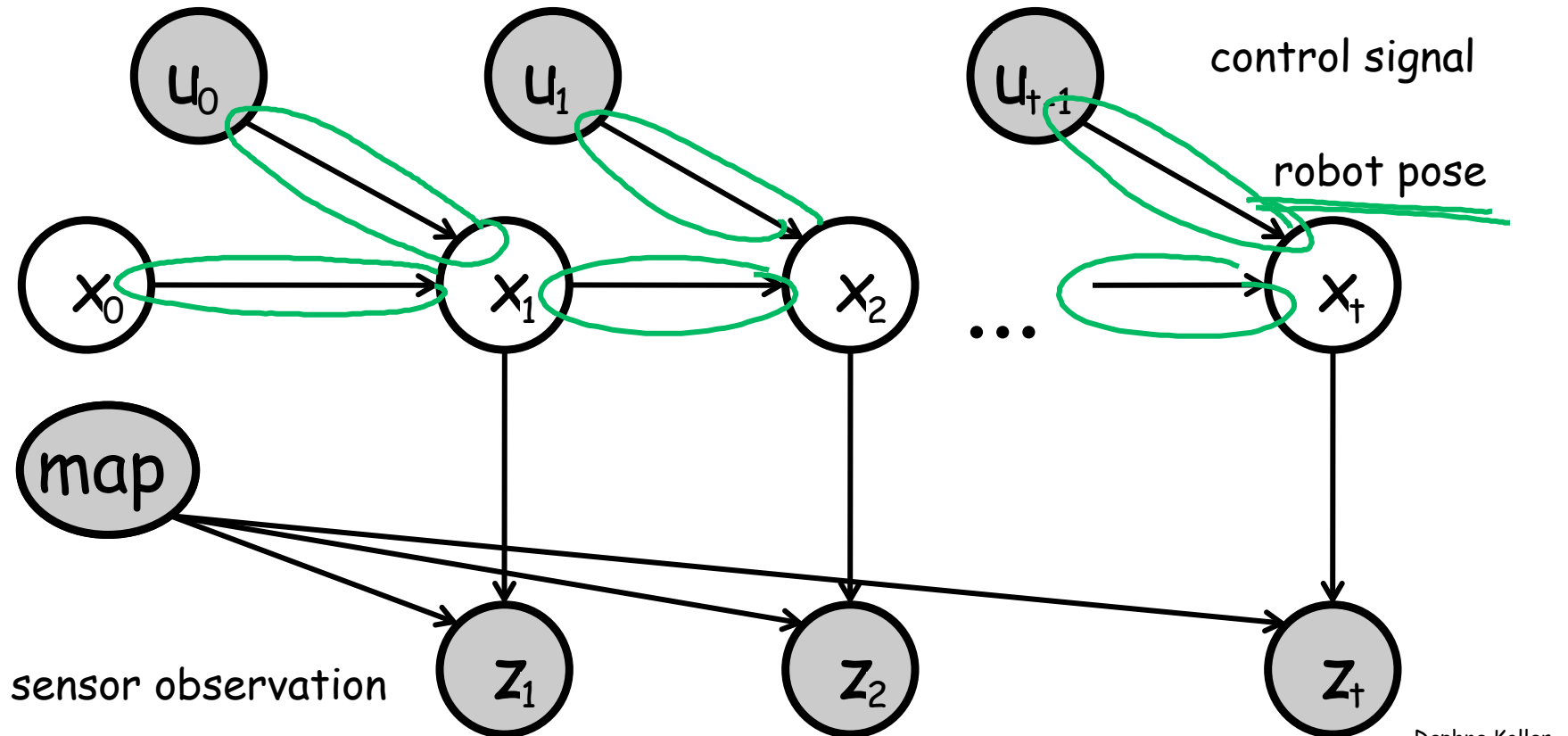
time series
position at
time t
changes over
time
robot dynamics
are fixed



Fox, Burgard, Thrun

Daphne Koller

Robot Localization



Template Variables

- Template variable $X(U_1, \dots, U_k)$ is instantiated (duplicated) multiple times
 - Location(t), Sonar(t)
 - Genotype(person), Phenotype(person)
 - Label(pixel)
 - Difficulty(course), Intelligence(student), Grade(course, student)

Template Models

- Languages that specify how ^{ground} variables inherit dependency model from template
- Dynamic Bayesian networks ← ^{temporal}
- Object-relational models ^{people, courses, pixels, ...}
 - Directed
 - Plate models
 - Undirected