**Motivation & Related Work**

Objective: Develop a model that allows known, local structure to be specified while also learning unknown global structure.

Approaches to Structured Prediction:

1. **Unstructured Models (a):**
   - Independent score per variable

   - Scoring functions factorize according to graphical model
   - Modeling global structure is generally intractable

2. **Classical Structured Models (b):**
   - Scoring functions factorize according to graphical model
   - Independent score per variable
   - Cannot use known structured scores

   - Graph Structured Prediction Energy Networks (d):
     - Score is non-linear function of joint variable prediction
     - Allows the use of any structured score function

**Model Formulation**

Notation:
- \( x \in X \): Input data (e.g., images)
- \( y = \{y_1, \ldots, y_N\} \): Output space object
- \( (y_1, \ldots, y_N) \in \prod_{r \in \{1, \ldots, N\}} \text{region graph} \)

Score Functions:
- Assign score to input-output pair \((x, y)\)
  - Unary (a): \( F(x, y) = \sum_{r \in \text{region graph}} f_r(x, y) \)
  - Structure (b): \( F(x, y) = \sum_{r \in \text{region graph}} f_r(x, y) \)

**Experiment**

**Optical Character Recognition**
- Characters rendered on high-noise background patches with different interpolation factors
- Examined different inference procedures during learning (below)

**References**