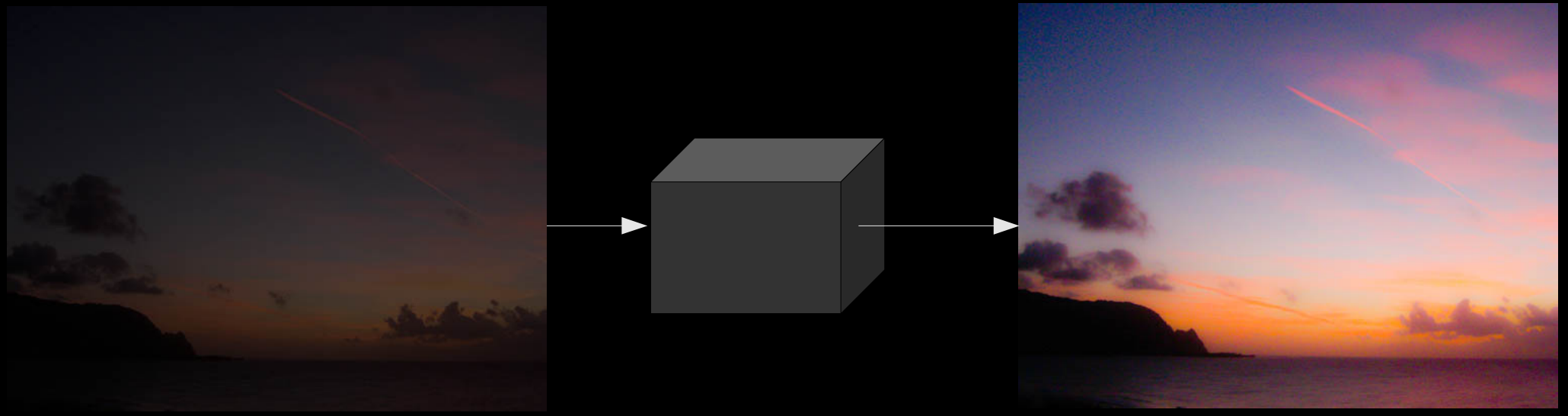
Computational Aesthetics

CS 294-69 Final Project

Armin Samii
Tim Althoff

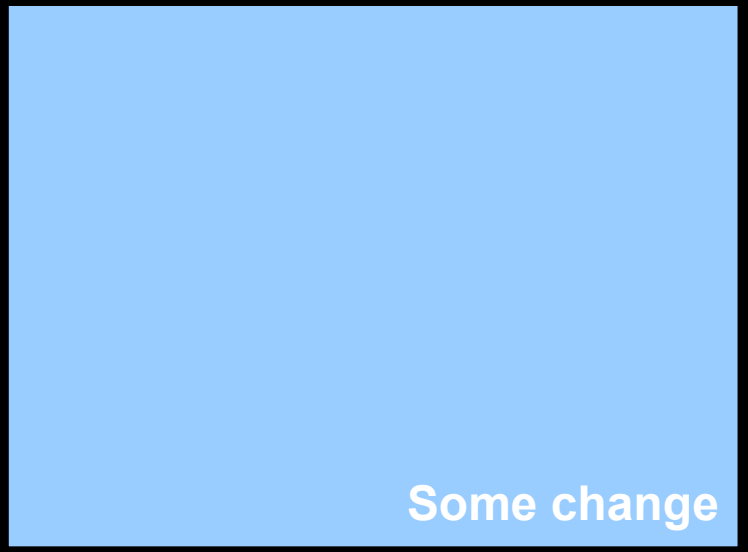
Problem

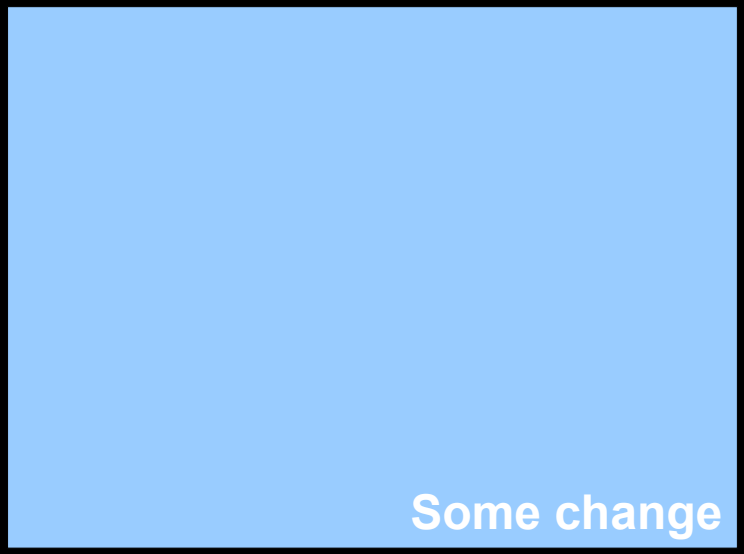


Problem

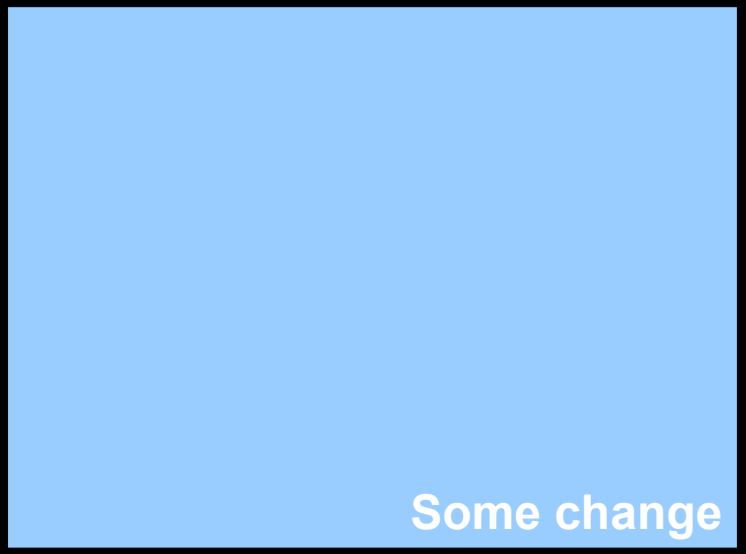
Problem

Problem





Problem



Problem

Problem

Roadblocks

- Training Data
  - Noisy
  - Repetitions
  - Hard to obtain
- Parameter Learning
  - Predict parameters using regression
- Sequence Learning
  - Feature-dependence (avoid repeating same sequence)
  - Training a good model
- User Interface
  - Simplicity
  - Facilitate learning

Approach

- Feature Extraction
  - Must be done for each iteration

Approach

- Feature Extraction
  - Must be done for each iteration
    - Must be fast

Approach

- Feature Extraction
  - Must be done for each iteration
    - Must be fast
    - We work on small (100x100) images

Approach

- Feature Extraction
  - Must be done for each iteration
    - Must be fast
    - We work on small (100x100) images
    - Features must be simple enough to be detected in thumbnails

Approach

- Feature Extraction
  - Must be done for each iteration
    - Must be fast
    - We work on small (100x100) images
    - Features must be simple enough to be detected in thumbnails
  - Features we use
    - Color-based

Approach

- Feature Extraction
  - Must be done for each iteration
    - Must be fast
    - We work on small (100x100) images
    - Features must be simple enough to be detected in thumbnails
  - Features we use
    - Color-based (e.g. histograms, contrast, etc.)

Approach

- Feature Extraction
  - Must be done for each iteration
    - Must be fast
    - We work on small (100x100) images
    - Features must be simple enough to be detected in thumbnails
  - Features we use
    - Color-based (e.g. histograms, contrast, etc.)
    - Simple Haar features for face detection

Approach

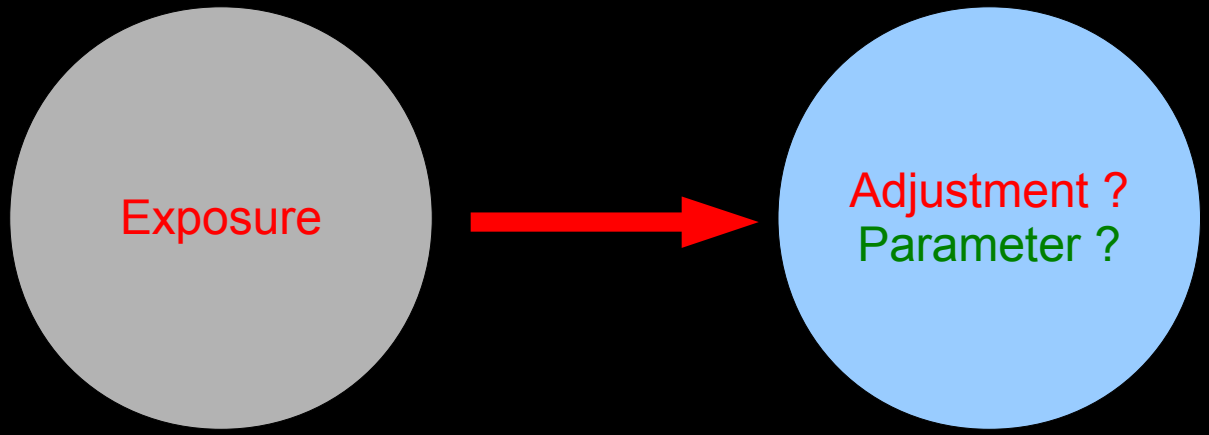
- Feature Extraction
  - Must be done for each iteration
    - Must be fast
    - We work on small (100x100) images
    - Features must be simple enough to be detected in thumbnails
  - Features we use
    - Color-based (e.g. histograms, contrast, etc.)
    - Simple Haar features for face detection (distinguish between portraits, group shots, etc.)

Approach

- Feature Extraction
  - Must be done for each iteration
    - Must be fast
    - We work on small (100x100) images
    - Features must be simple enough to be detected in thumbnails
  - Features we use (~30 total)
    - Color-based (e.g. histograms, contrast, etc.)
    - Simple Haar features for face detection (distinguish between portraits, group shots, etc.)

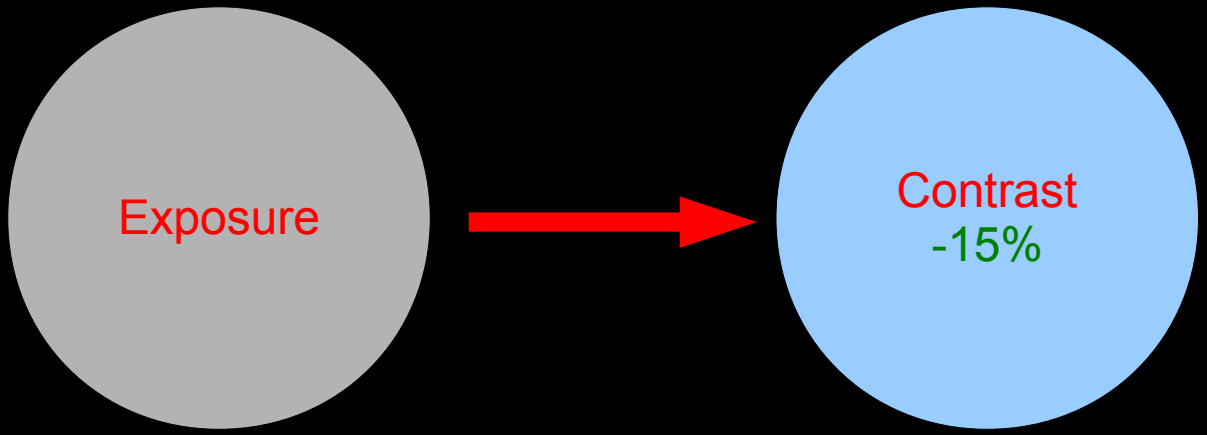
Approach

- Parameter learning
  - P(adjustment strength | features, adjustment)
  - Regression techniques
- Sequence Learning
  - P(next adjustment(s) | features, previous adjustments)
  - N-grams + features



Approach

- Parameter learning
  - P(adjustment strength | features, adjustment)
  - Regression techniques
- Sequence Learning
  - P(next adjustment(s) | features, previous adjustments)
  - N-grams + features



Approach

- Parameter learning
  - P(adjustment strength | features, adjustment)
  - Regression techniques:
    - Linear
    - Ridge
    - Lasso
    - Lars
    - ElasticNet
    - Gaussian Procress

$$0.5 * ||Xw - y||_2^2 + \alpha * \rho * ||w||_1 + \alpha * (1 - \rho) * 0.5 * ||w||_2^2$$

Approach

- Sequence Learning
- P(next adjustment(s) | features, previous adjustments)

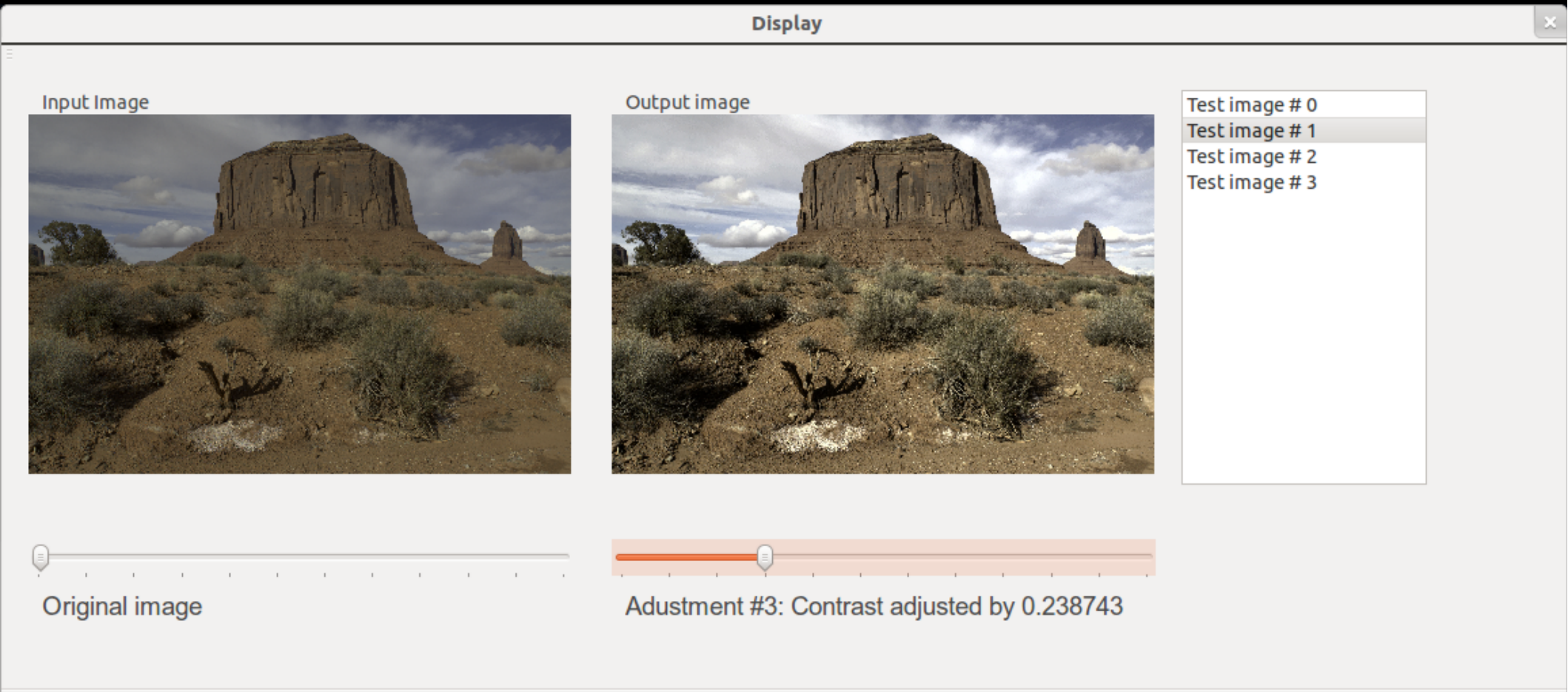
  → ”Feature-augmented n-grams”
- n-gram: sequence of n items from a given sequence
- n-gram model → (n − 1)-order Markov model
- Feature augmentation

$$P(adj_i|adj_{i-1}, adj_{i-2}, \underline{feat_{i-1}}) \propto$$
$$P(\underline{feat_{i-1}}|adj_i, adj_{i-1}, adj_{i-2}) \cdot P(adj_i|adj_{i-1}, adj_{i-2})$$

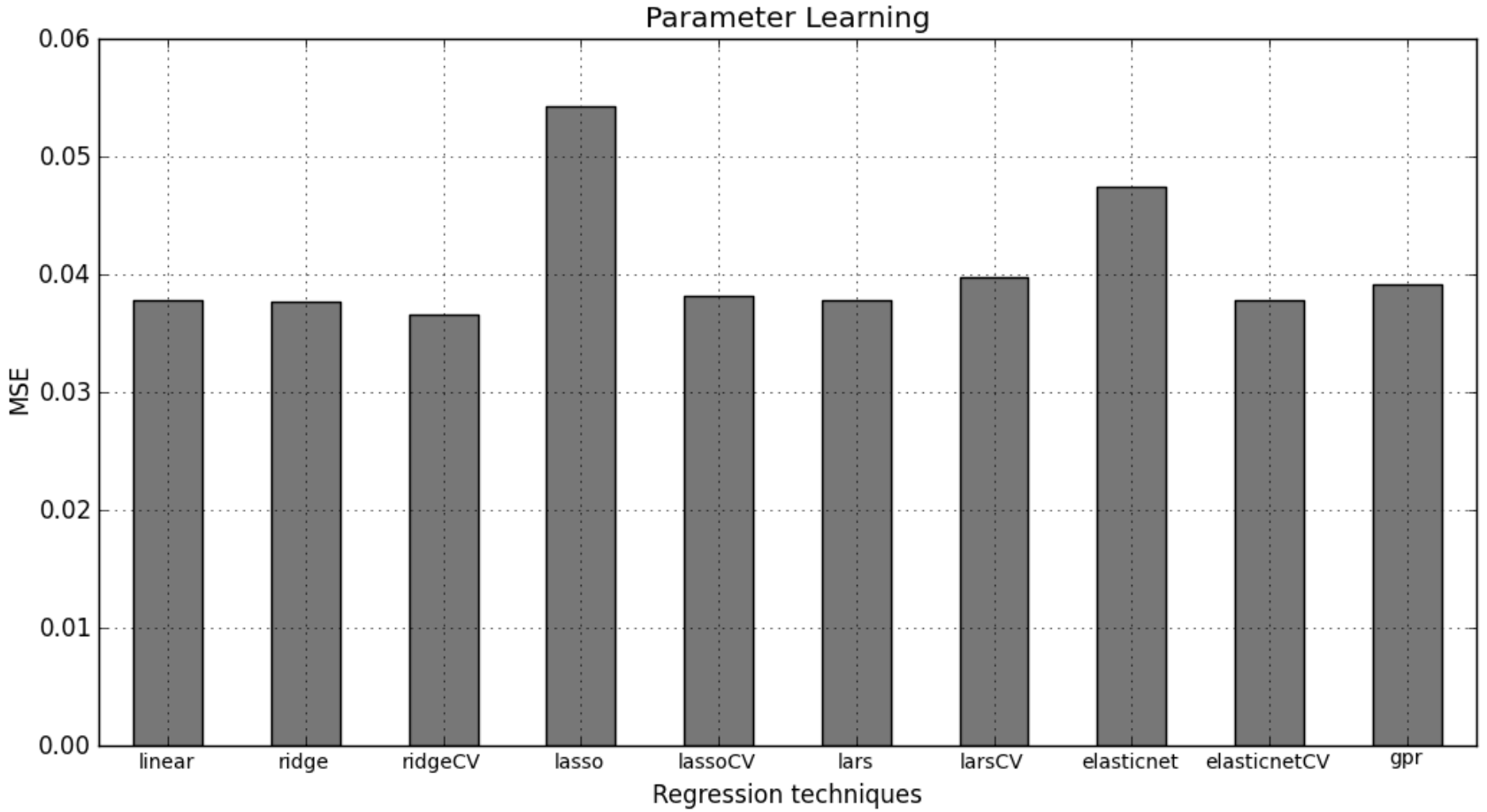
Modelled by GMM Tri-gram

Approach

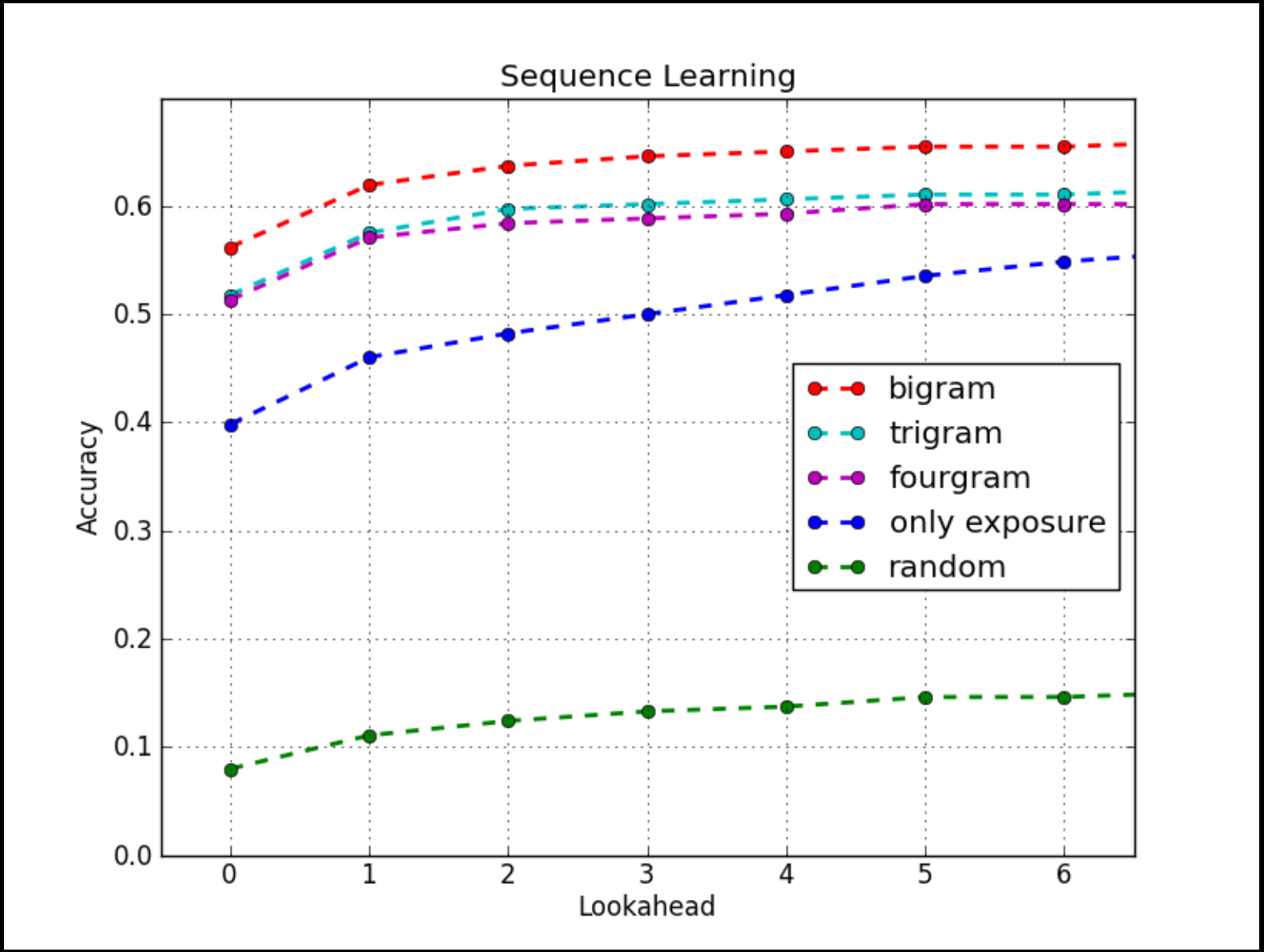
- User interface
  - Show user each step in sequence



Results: Parameter learning



Results: Sequence learning



Future Work

- More features
- Local edits
  - Treat skin separately
  - Gradients (e.g. horizon)
  - Foreground/background separation
- Style modeling
- User personalization
  - a*GeneralModel + (1-a)*UserModel
- User study


Demo