Estimating Soccer Player Performance with Similarity Search Regression

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Motivation

- Money has flooded into European soccer
  - Most expensive player deal
    - 1992: £18 million
    - 2013: £85.3 million
- Lack of competitive balance like American sports
  - Unbounded budgets
  - No requirement to “balance the books”
  - Uneven distribution of commercial revenue
  - No limit to wages

Motivation (cont.)

- But there's hope!
- 40% success rate [7]
- Problem
  - Increase success rate
  - Player impact = goals scored
- Solution
  - *k*-Nearest neighbor regression model
    - Predicts goal output based on "similar" players' goal output

Hypothesis

A *k*-nearest neighbor regression model will output perform linear regression and ridge regression in the task of predicting single season goal production from a qualitative skills data set of professional players.

Data Sets

- Proprietary, *quantitative* data sets

- Free, *qualitative* data sets

EA Sports Data

Curve

Finishing

Balance

Positioning

“Tactical” Reactions

Data Sets (cont.)

- Qualitative skills data
  - EA Sports data set
  - Last names only
  - 36 attributes == high dimensionality?
- Goal production
  - 2014/2015 season
  - Covered all 39 leagues
  - Transfermarket.co.uk
- Full names
  - Needed to cross reference goal data
  - futwiz.com

Background: *k*-Nearest Neighbor

- Lazy learning

- “Similarity” searches

- Regression

Background: Distance Metrics

- Intuitions in high dimensions [12][5]

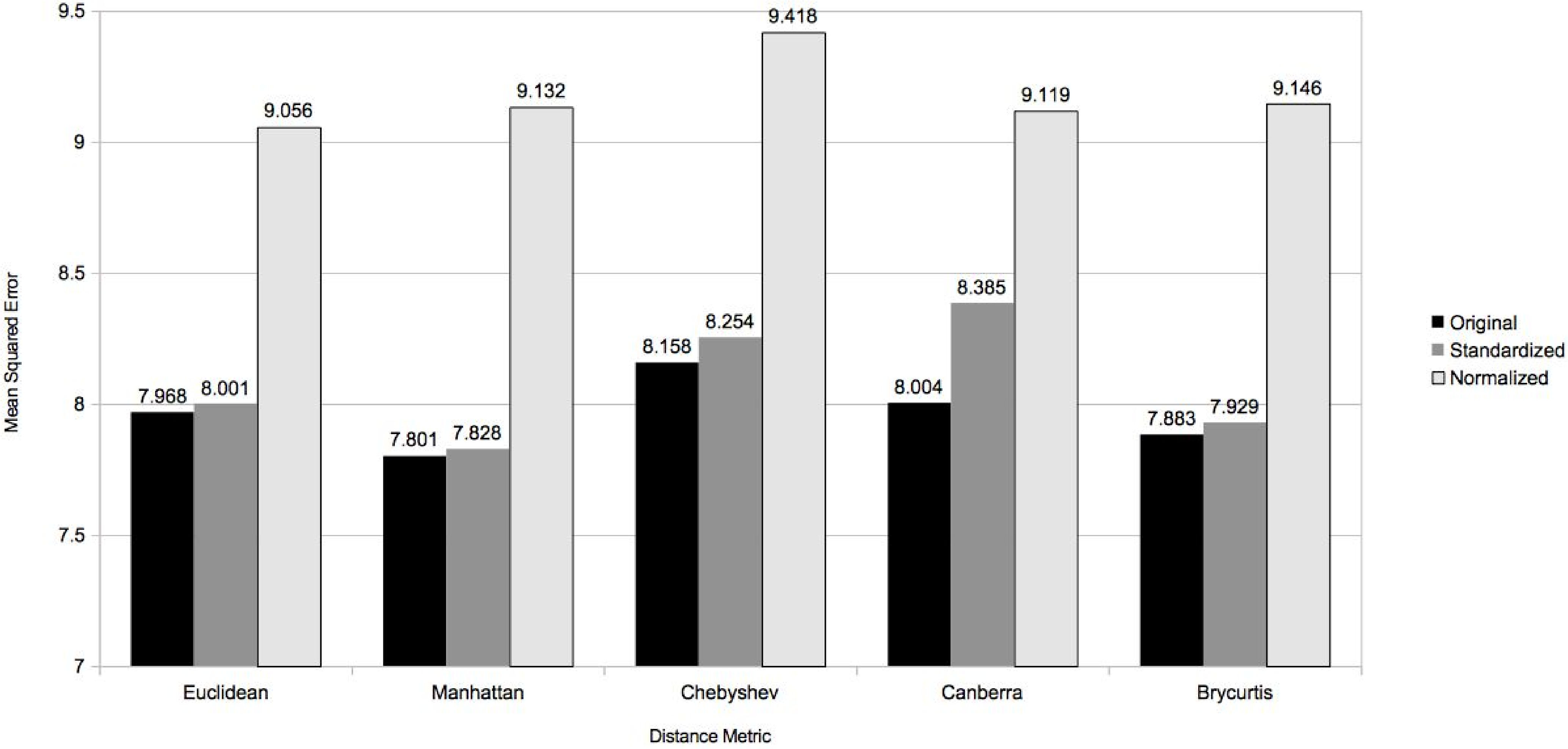
- Effect on space partitioning

- Adapt distance function or reduce data dimensionality [9]

Experimental Approach

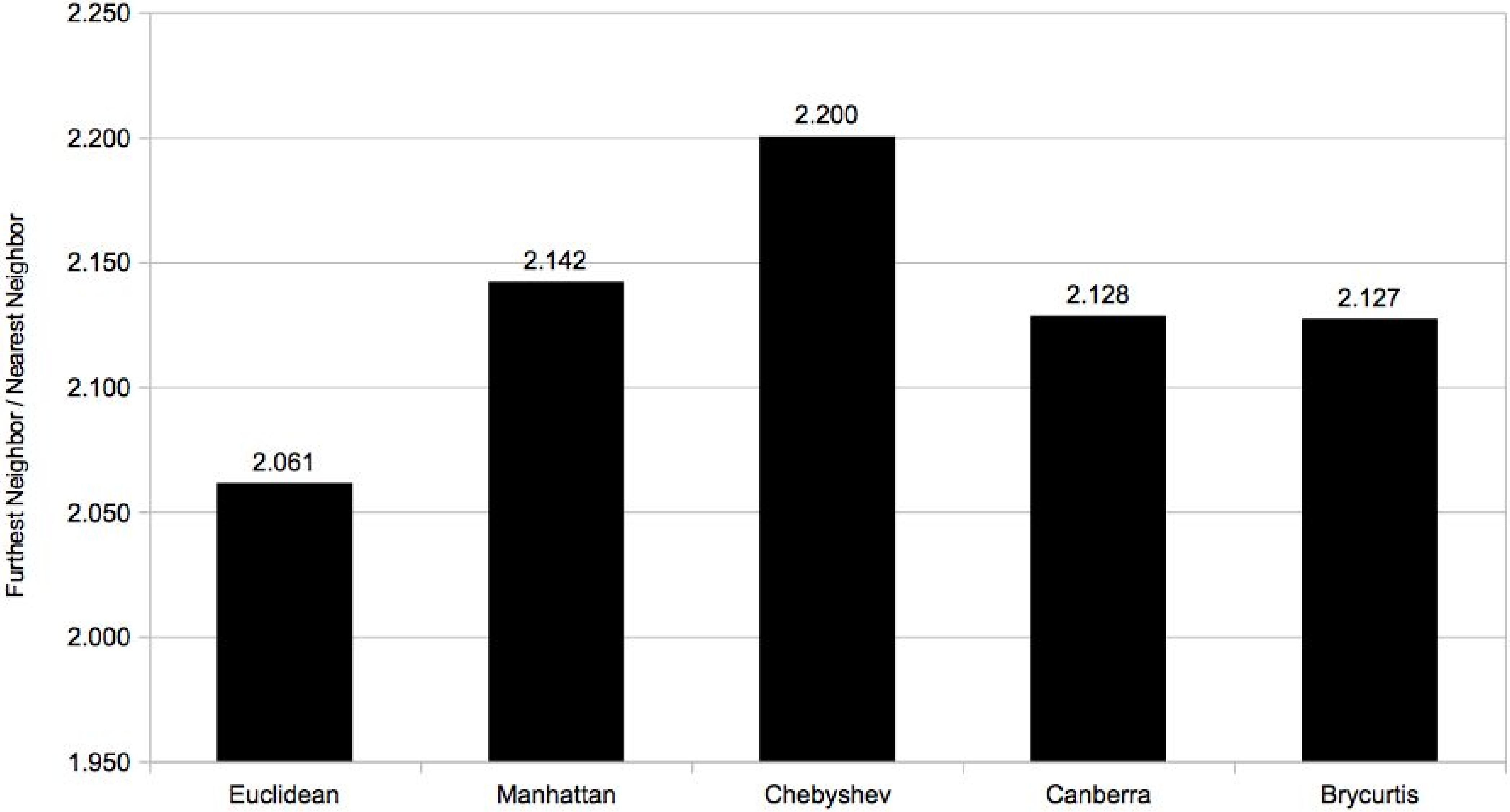
- Hyperparameter tuning
  - Distance functions
  - Feature selection
  - *k*
  - How much each neighbor contributes
- Algorithm Comparison
  - Linear regression
  - Ridge regression
  - Radius nearest neighbor
- Machine learning library ‘sklearn’

Distance Metric Comparison

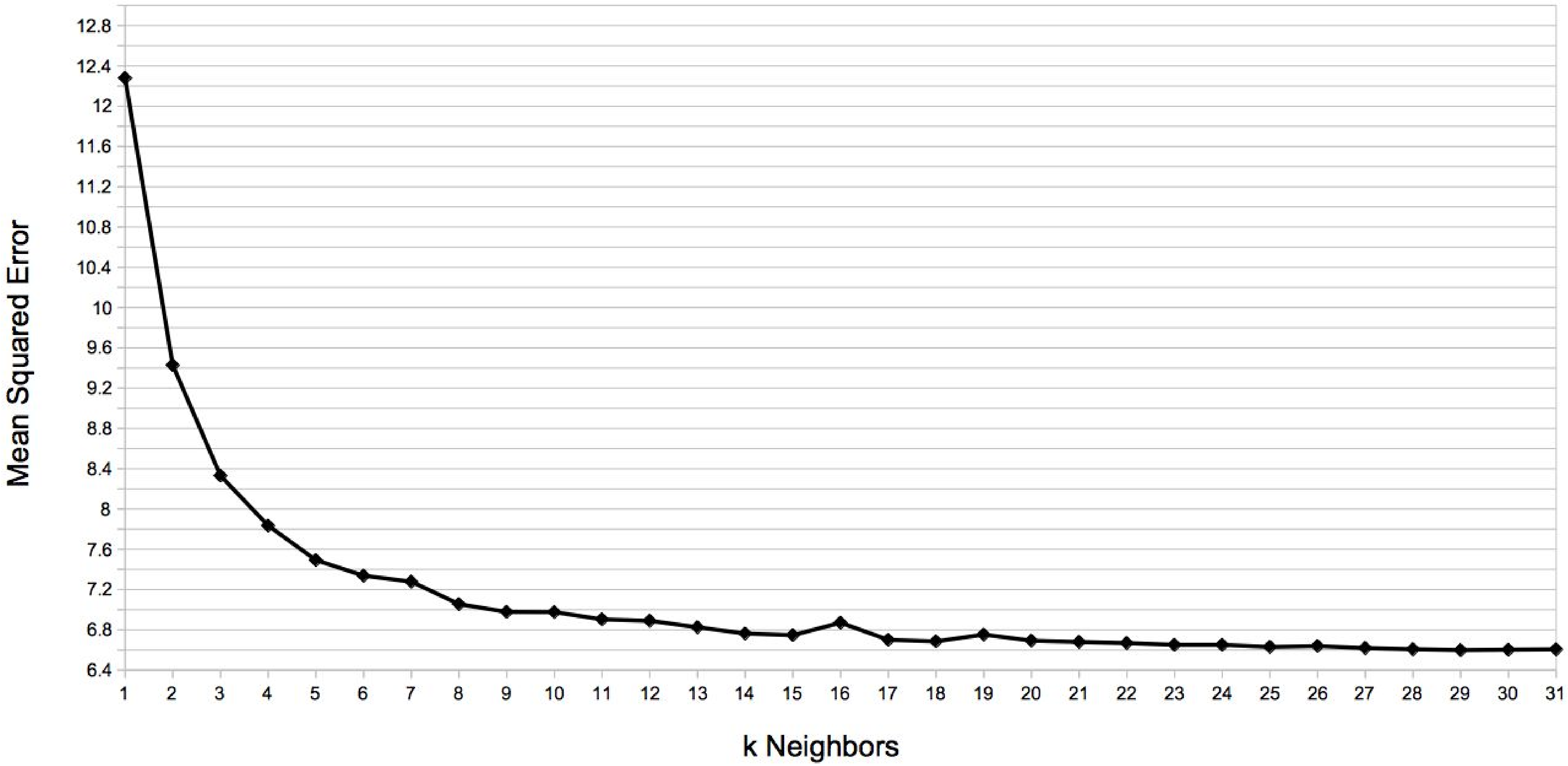


*Fractional distances performed poorly and aren’t reported

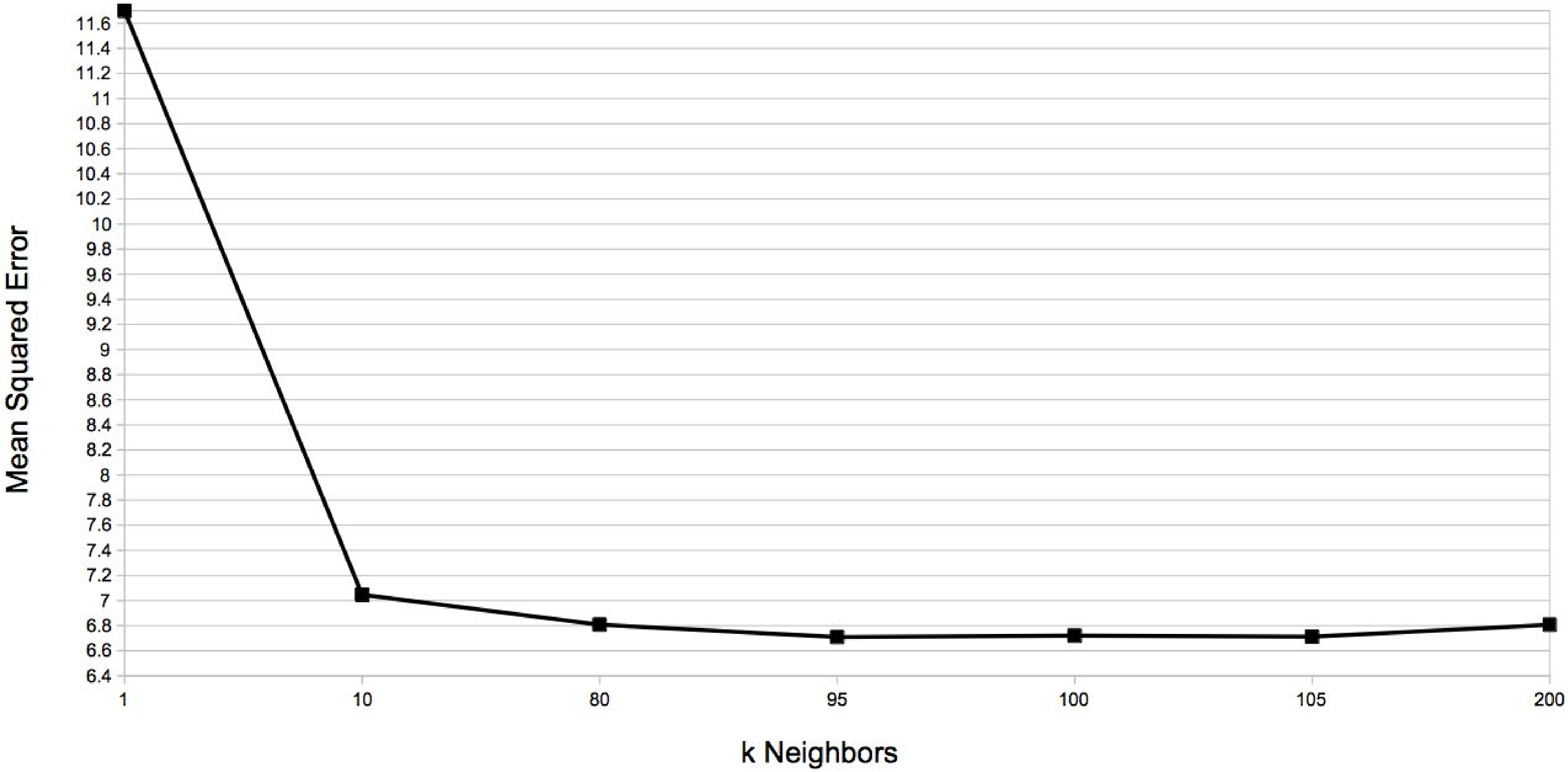
Contrast Ratio



Stepwise Forward Selection



Stepwise Backward Elimination

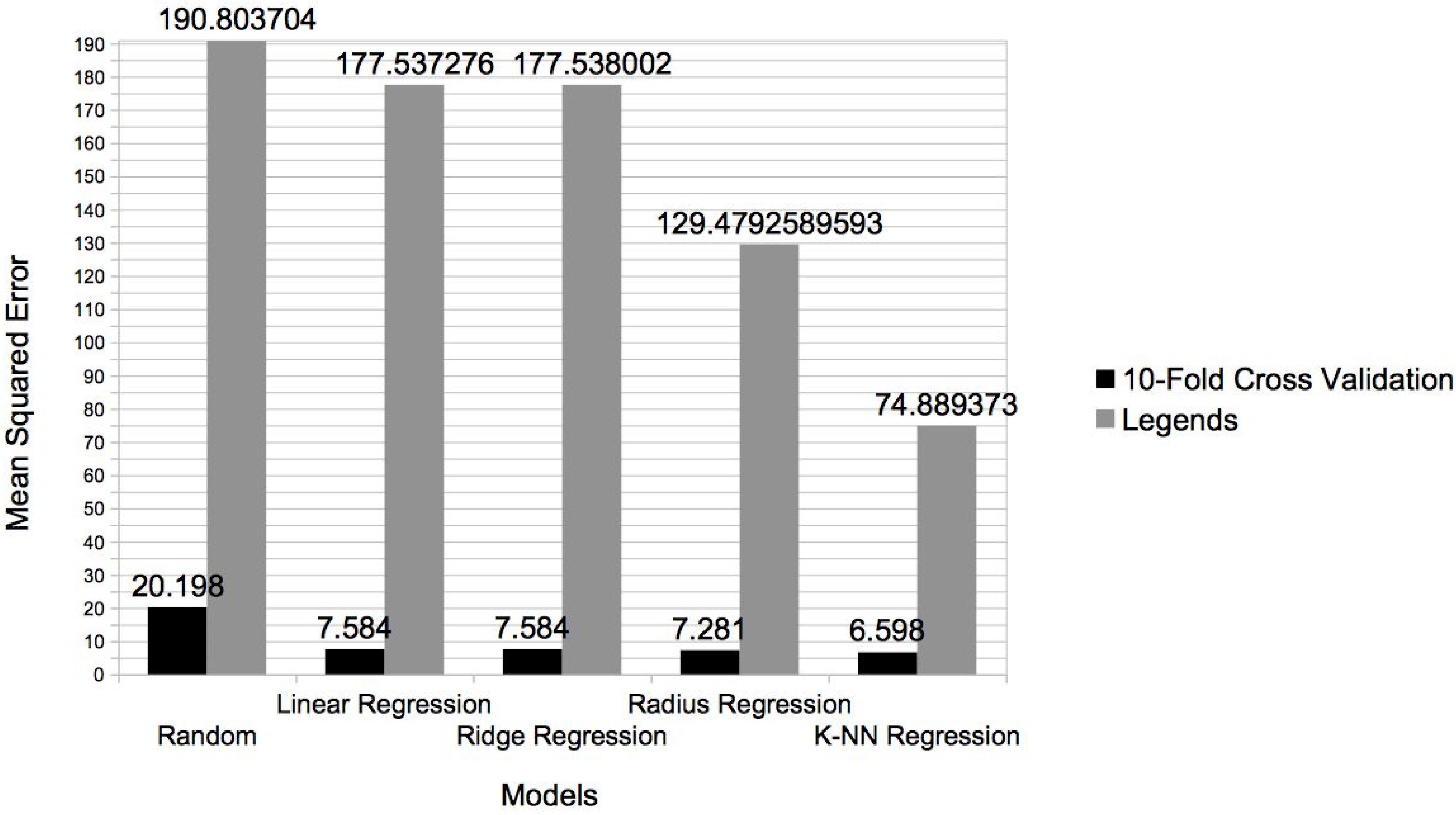


Other Hyperparameter Results

- Forward selection features + “expert”-chosen features

- Uniform weighting vs Inverse distance weighting

Linear vs. Non-linear Models



Analysis

- Qualitative features selected
- Increase in contrast
- Legendary data set
- Cross validation error

Future Work

- More feature selection
- Quantify selected features
- Weighting neighbor contributions
- MARS/LOESS

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