

PSY9511: Seminar 5

Beyond linearity: Extensions of linear models and tree-based models

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3. Recap
4. Extensions of linear models
 - 4.1 Generalized linear models (GLMs)
 - 4.2 Generalized additive models (GAMs)
5. Tree-based models
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 - 5.2 Random forests
 - 5.3 Gradient boosting (XGBoost)
6. Neural networks (Lecture 7/8)



Exercise 3



Exercise 3: Backward stepwise selection

<http://localhost:8888/notebooks/notebooks%2FBackward%20selection.ipynb>



Exercise 3: Lasso

<http://localhost:8888/notebooks/notebooks/Lasso.ipynb>



Exercise 4



Extensions of linear models



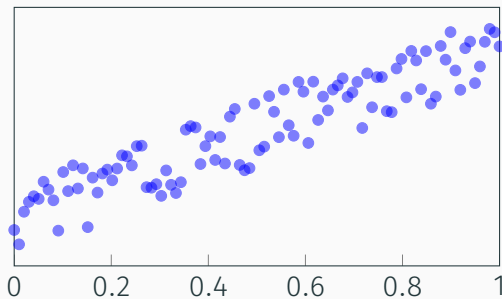
Extensions of linear models: Motivation



$$\hat{y} = \beta_0 + \sum_{i=0}^p \beta_i x_i$$

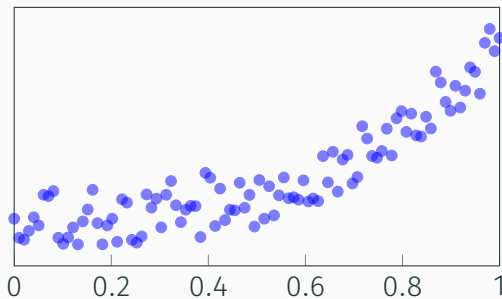


Extensions of linear models: Motivation



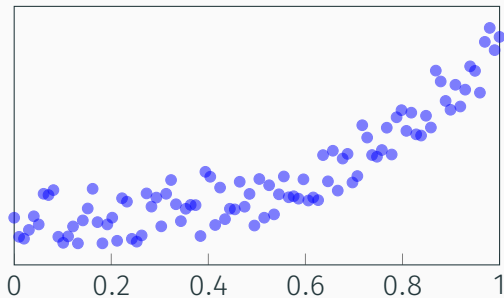
$$\hat{y} = \beta_0 + \sum_{i=0}^p \beta_i x_i$$

Extensions of linear models: Motivation



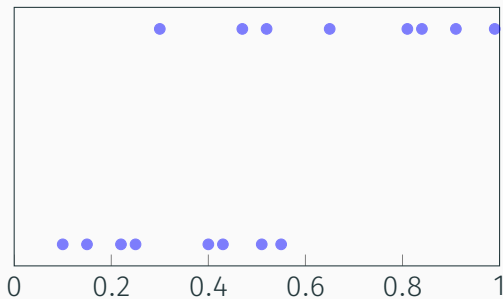
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Extensions of linear models: Motivation



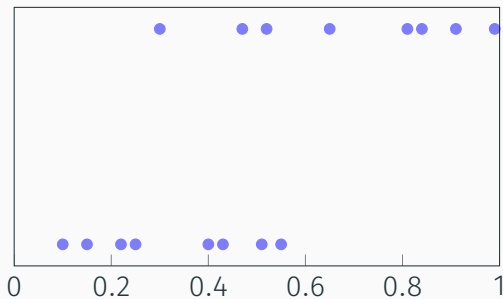
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Extensions of linear models: Motivation



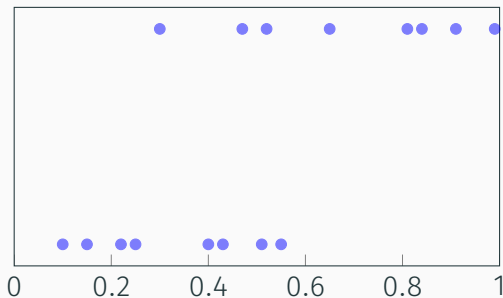
$$\hat{y} = \beta_0 + \sum_{i=0}^p \beta_i x_i$$

Extensions of linear models: Motivation



$$\log \left(\frac{p(X)}{1 - p(X)} \right) = \beta_0 + \sum_{i=0}^p \beta_i x_i$$

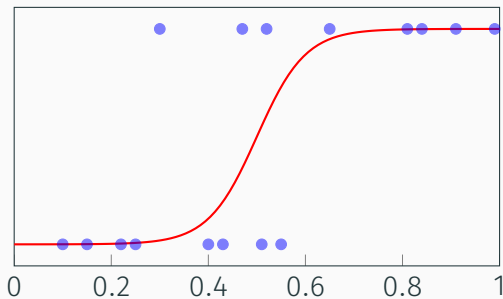
Extensions of linear models: Motivation



$$p(X) = \frac{e^{\left(\beta_0 + \sum_{i=0}^p \beta_i x_i\right)}}{1 + e^{\left(\beta_0 + \sum_{i=0}^p \beta_i x_i\right)}}$$



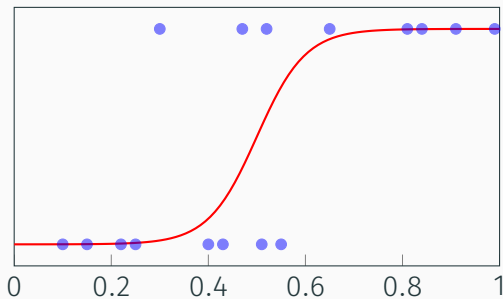
Extensions of linear models: Motivation



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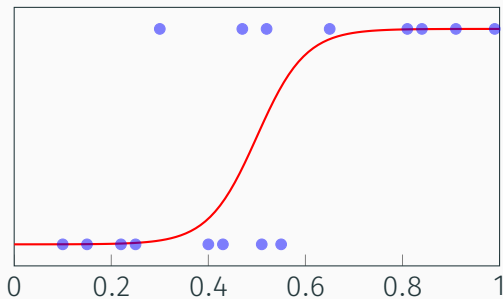
Extensions of linear models: Motivation



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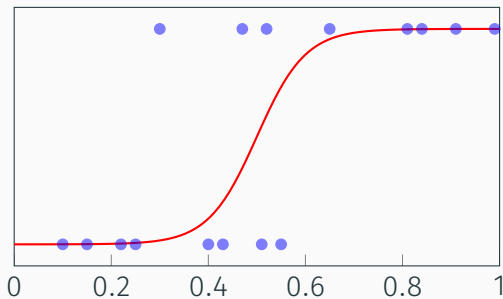


Extensions of linear models: Motivation



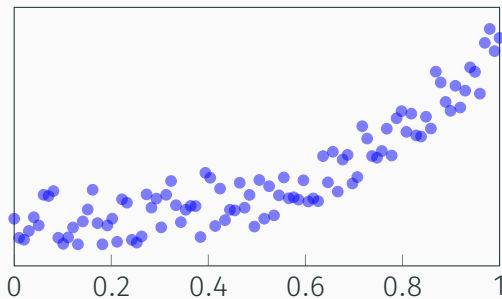
$$p(X) = f\left(\beta_0 + \sum_{i=0}^p \beta_i x_i\right)$$

Extensions of linear models: Motivation



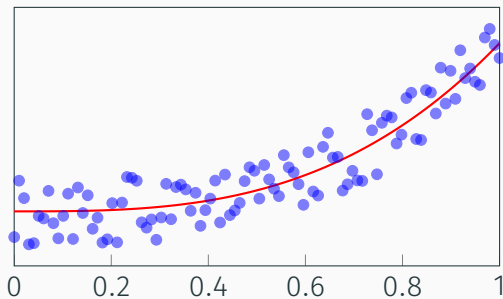
$$f(\hat{y}) = \beta_0 + \sum_{i=0}^p \beta_i x_i$$

Extensions of linear models: Motivation



$$f(\hat{y}) = \beta_0 + \sum_{i=0}^p \beta_i x_i$$

Extensions of linear models: Motivation



$$\log(\hat{y}) = \beta_0 + \sum_{i=0}^p \beta_i x_i$$





Generalized linear models (GLMs):

Extends upon the regular linear model by associating the predictors to the response via a non-linear link function.



Tree-based models

