

# PAID SEARCH KEYWORD ROI OPTIMIZATION BY MACHINE LEARNING

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# SUFFERING CLEANSSES THE SOUL



- However, this presentation will not make you suffer



## THE GOAL:

# BETTER PAID KEYWORD RETURN ON INVESTMENT

- Paid Search Keyword Purchases
- Need to pick paid keywords with higher rates of return on investment
- Will use properties of keywords, features, to help predict ROI

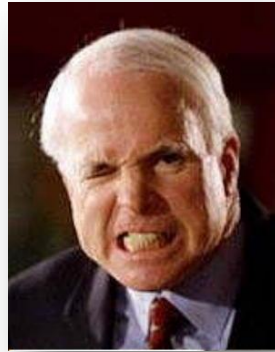
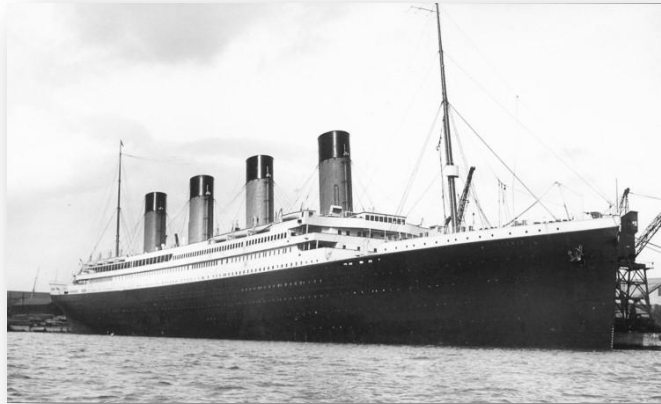


## HOLD ON...WHY EVEN DO THIS?

- Google AdWords are a great proxy for value, but site agnostic
- Site-Specific Insights are Lacking
- We want keyword valuation tool
- The cost: Internal data and external data



# WHAT CAN WE MODEL AND PREDICT?

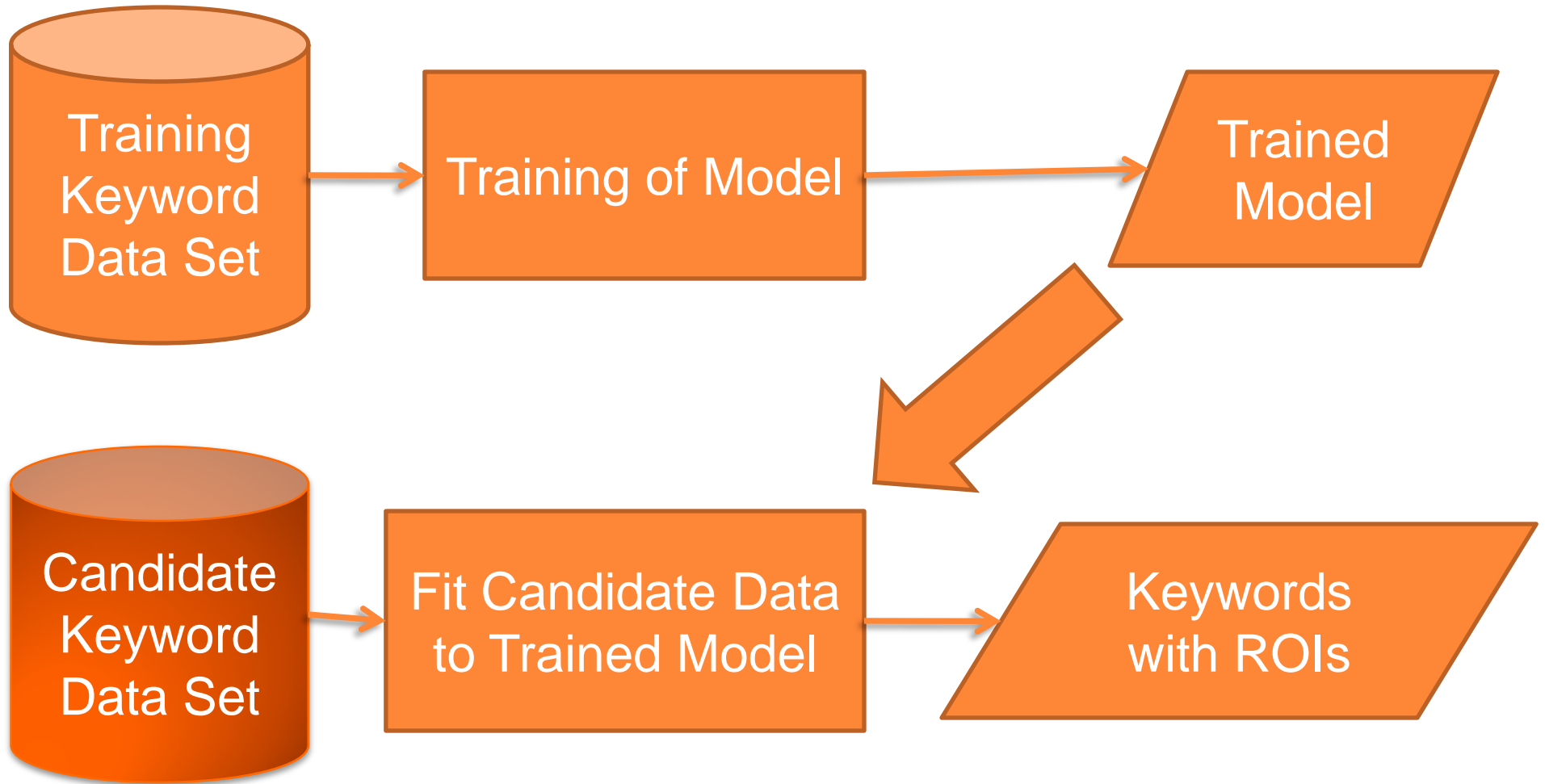


# ML EXAMPLE: PREDICTING HOUSE PRICES

- Suburban Boston Home Prices
  - 14 *features*, infinite possible prices
- Linear Regression – **Easiest!**
  - Correlation: **84.5%**, error \$3400
- Neural Network, Multilayer Perceptron
  - Correlation: **87.3%**, error \$3200
- Gaussian Process
  - Correlation: **90.5%**, error \$2700



# MACHINE LEARNING



# SUPERVISED MACHINE LEARNING CHEAT SHEET

- We have some (hopefully) predictive data
  - Correlation, causation
- Data has features and final output
- Choose a classifier algorithm
  - Regression Models, Bayesian Statistics, Neural Networks, Rules-Based
- Train the model using your copious data
  - Model the data, fit a function
  - Validate the model
- With the trained model, feed it new data
  - Give it inputs, see what output you get



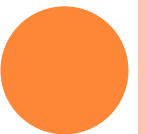
# WHAT FEATURES ARE PUBLIC?

- For each Keyword, we can find out:
  - Search Volume
  - Search Competition
  - Paid Search Cost Per Click
  - Meaning of Keywords
  - Heuristics (Intent Clues)
  - Lots of things, use your imagination!



# WHAT FEATURES ARE PRIVATE?

- Keyword Data from your Analytics:
  - Keyword ROI on my website
  - Keyword conversion percentage
  - User Demographics
  - You have a brain, exercise it
- Custom ROI For Your Website
  - Better than CPC Price



# MACHINE LEARNING DATA

## ○ Training Keywords with Features and ROI:



- Dog Food,  $Vol_1$ ,  $Comp_1$ ,  $\$CPC_1$ , 50% ROI
- Puppy Food,  $Vol_2$ ,  $Comp_2$ ,  $\$CPC_2$ , 25% ROI
- Kitty treats,  $Vol_3$ ,  $Comp_3$ ,  $\$CPC_3$ , 0% ROI
- Cat Chow,  $Vol_4$ ,  $Comp_4$ ,  $\$CPC_4$ , -15% ROI

## ○ Candidate Keywords with Features and ROI:

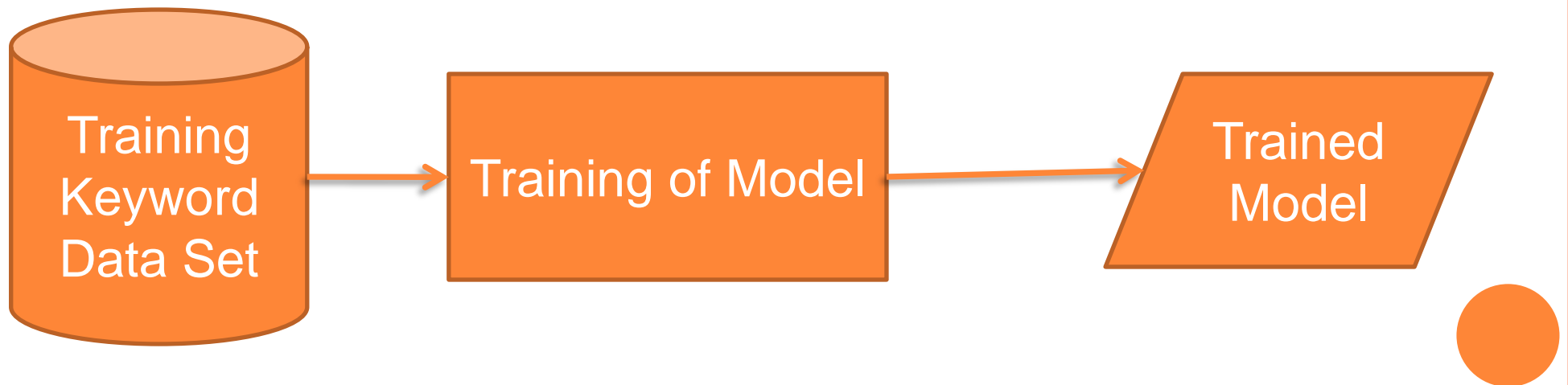


- Pet food,  $Vol_A$ ,  $Comp_A$ ,  $\$CPC_A$ , ??% ROI
- Pet nutrition,  $Vol_B$ ,  $Comp_B$ ,  $\$CPC_B$ , ??% ROI



# MODEL EXPECTED KEYWORD ROI

- Model Revenue & Costs
  - We get return-on-investment
- Most important aspect is good features and enough data
- Could use many different models



## FINAL STEP: GET BETTER KEYWORDS

- Get keyword suggestions, get related features
- Push through trained model, and evaluate whether to buy
- Update Model, Repeat



# MACHINE LEARNING DATA



- Training Keywords with **Features** and **ROI**:
  - Dog Food,  $Vol_1$ ,  $Comp_1$ ,  $\$CPC_1 \dots F_{n1}$ , 50% ROI
  - Puppy Food,  $Vol_2$ ,  $Comp_2$ ,  $\$CPC_2 \dots F_{n2}$ , 25% ROI
  - Kitty treats,  $Vol_3$ ,  $Comp_3$ ,  $\$CPC_3 \dots F_{n3}$ , 0% ROI
  - Fido Food,  $Vol_4$ ,  $Comp_4$ ,  $\$CPC_4 \dots F_{n4}$ , -15% ROI



- Candidate Keywords with **Features** and **ROI**:
  - Pet food,  $Vol_1$ ,  $Comp_1$ ,  $\$CPC_1 \dots F_{n1}$ , 40% ROI
  - Pet nutrition,  $Vol_1$ ,  $Comp_1$ ,  $\$CPC_1 \dots F_{n1}$ , 100% ROI



# THE PROCESS CONTINUES FOREVER

- Pick your keywords with highest ROI
- Verify how good your model is
- Update your model
- Update your data
- Keep picking better keyword features
- Make Money



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