Algorithms in data science

- Model algorithm
- Training algorithm
- Inference algorithm

Algorithms in data science

- Model algorithm
  - Often explicitly expressed as equations
  - Sometimes a set of rules
  - Has parameters
- Training algorithm
- Inference algorithm

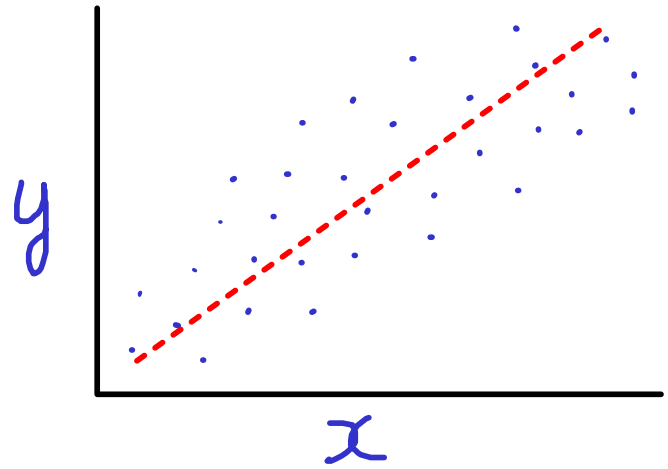
How can a model be an algorithm?

Model

$$y_i = \beta_0 + \beta_1 x_i$$

Data table

i	y	x
1	28.4	10.2
2	47.6	15.7
...		
...		
85	35.1	12.9



How can a model be an algorithm?

Model

$$y_i = \beta_0 + \beta_1 x_i$$

Algorithm (this version is atomic code)

```
> for ( i in 1:n ) {
>   y[i] = b_0 + b_1 * x[i]
> }
```

Data table

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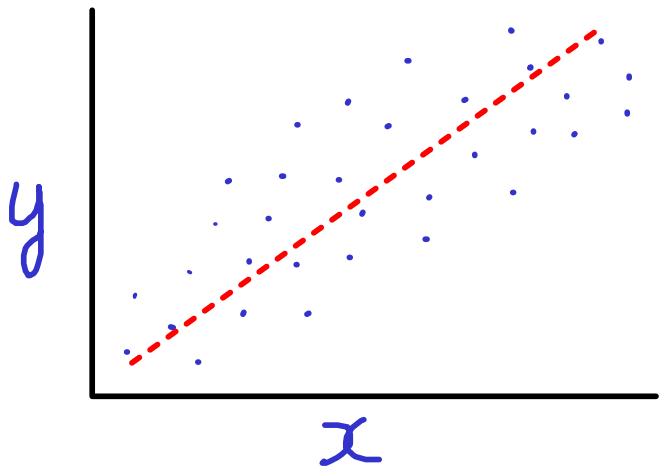

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> for ( i in 1:n ) {
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```

Vectorized R code

```
> y <- b_0 + b_1 * x
```

Data table

i	y	x
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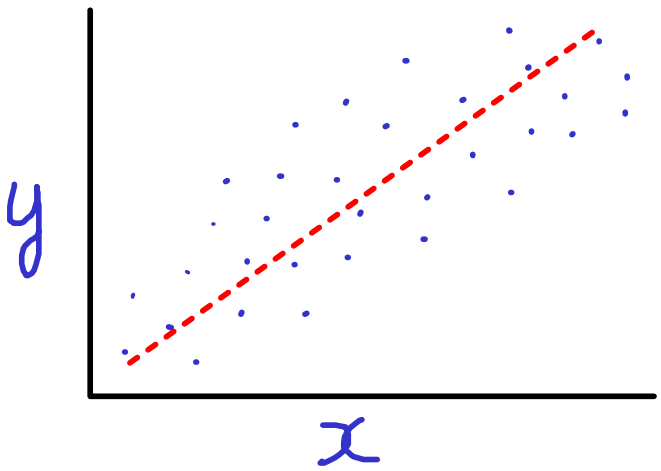
...		
85	35.1	12.9



Algorithms in data science

- Model algorithm
- Training algorithm
  - An algorithm to train a model algorithm on data
  - syn. model fitting, calibration
  - e.g. least squares, maximum likelihood
  - try typing lm into the R console
- Inference algorithm

Algorithms in data science

- Model algorithm
- Training algorithm
- Inference algorithm
  - looking back: considering all the ways data could have happened
  - looking forward: predicting new data and testing against them

Workflow algorithms in DS

- Pipelines, standard conventions ...

Master Data Science Algorithm

```
Plan for data
Acquire data
Manage data
Analyze data
Infer from data
Report about data
```