# Machine learning basics

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2019/02/13

# Machine learning

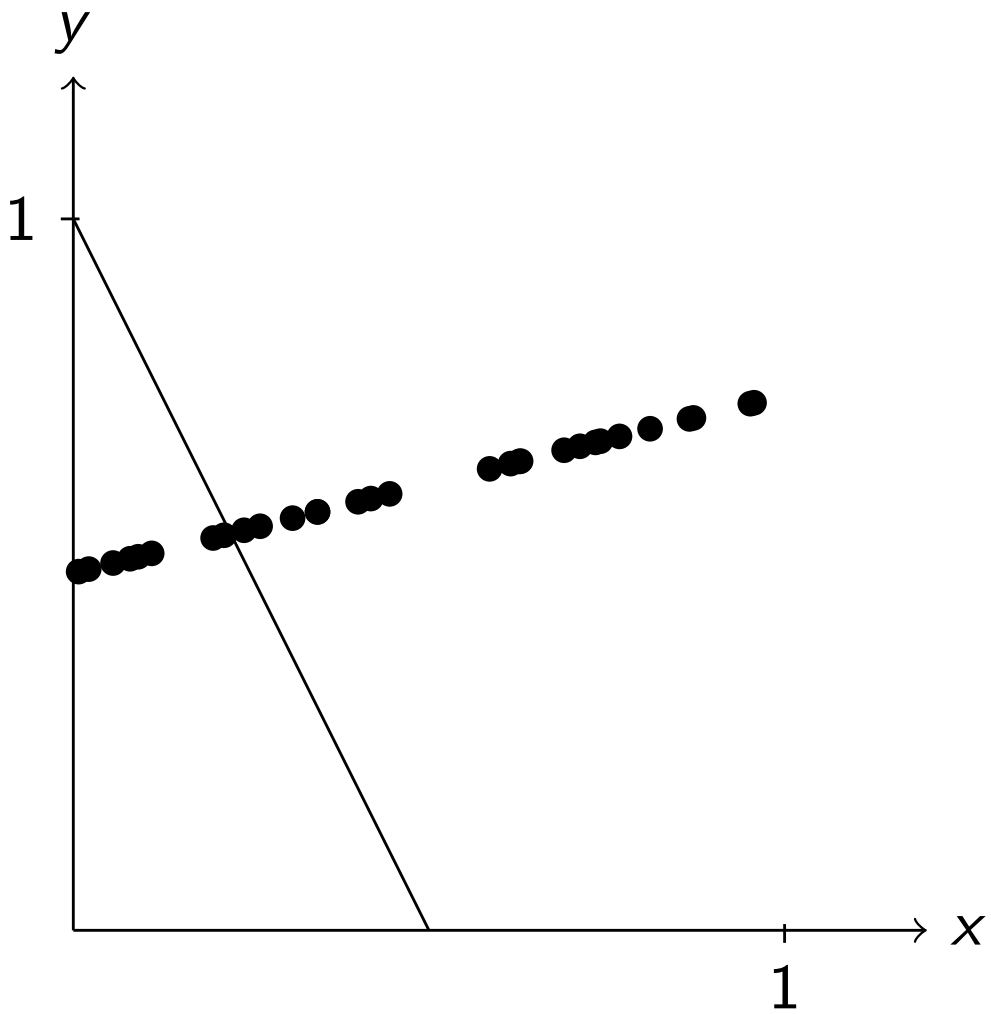
Machine learning (ML) is a subfield of artificial intelligence.

**Intuitively** We want to *learn from* and *make predictions on* data.

**Technically** We want to update the parameters of a model to make it describe our training data as well as possible ("well" being defined by a *loss function*).

# Model example

## Linear regression



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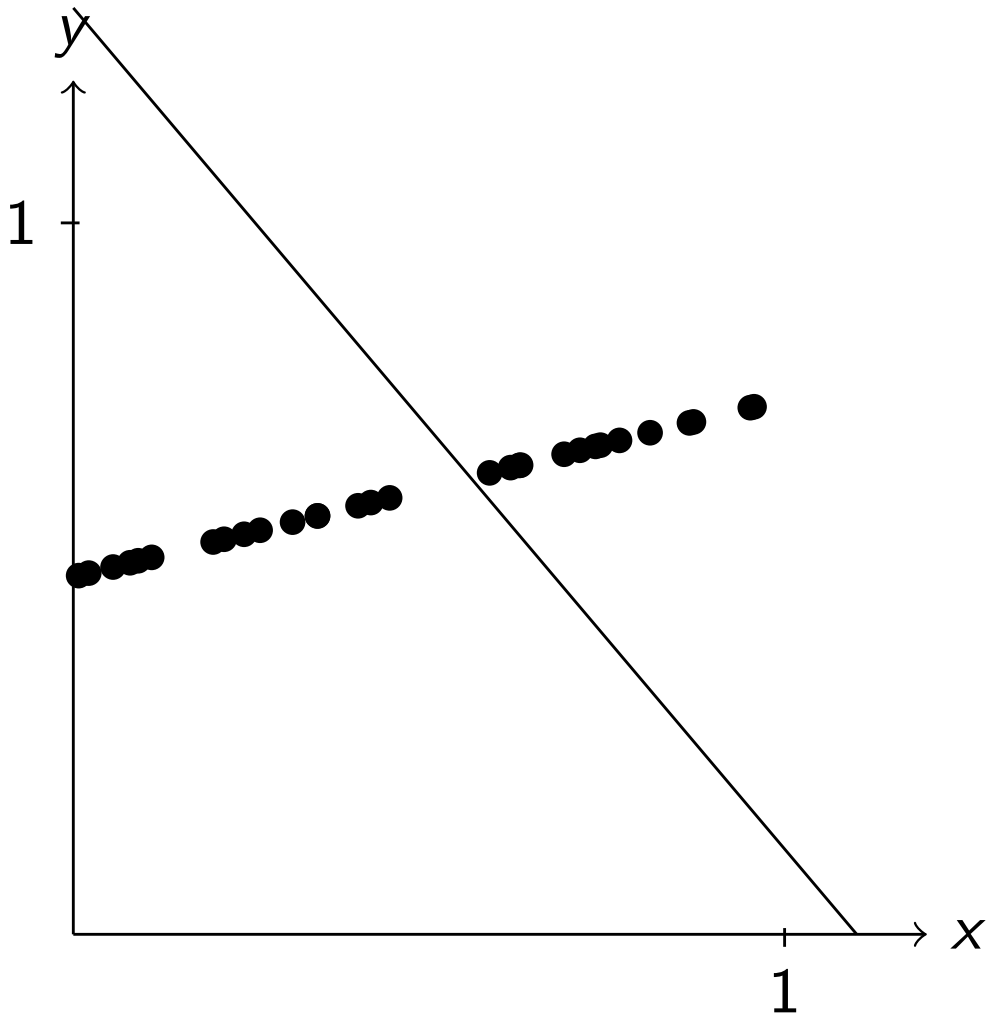

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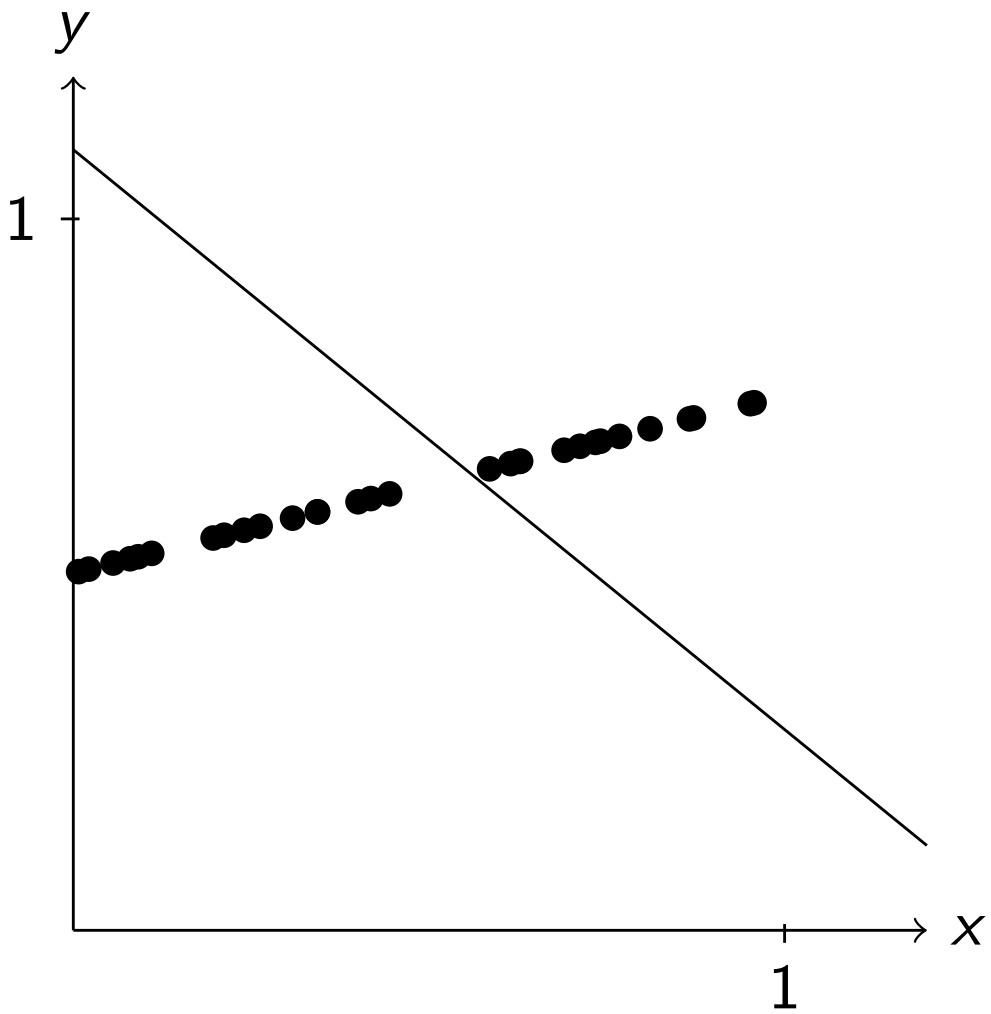

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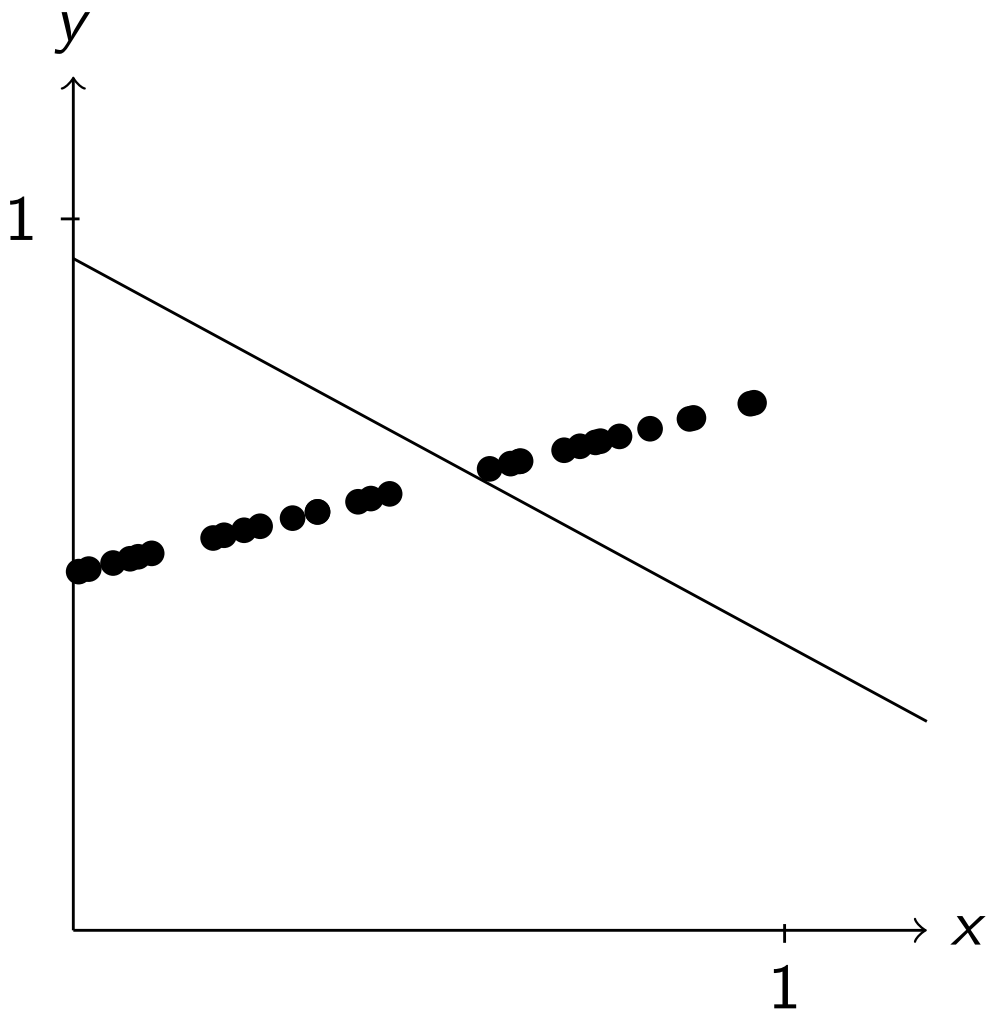

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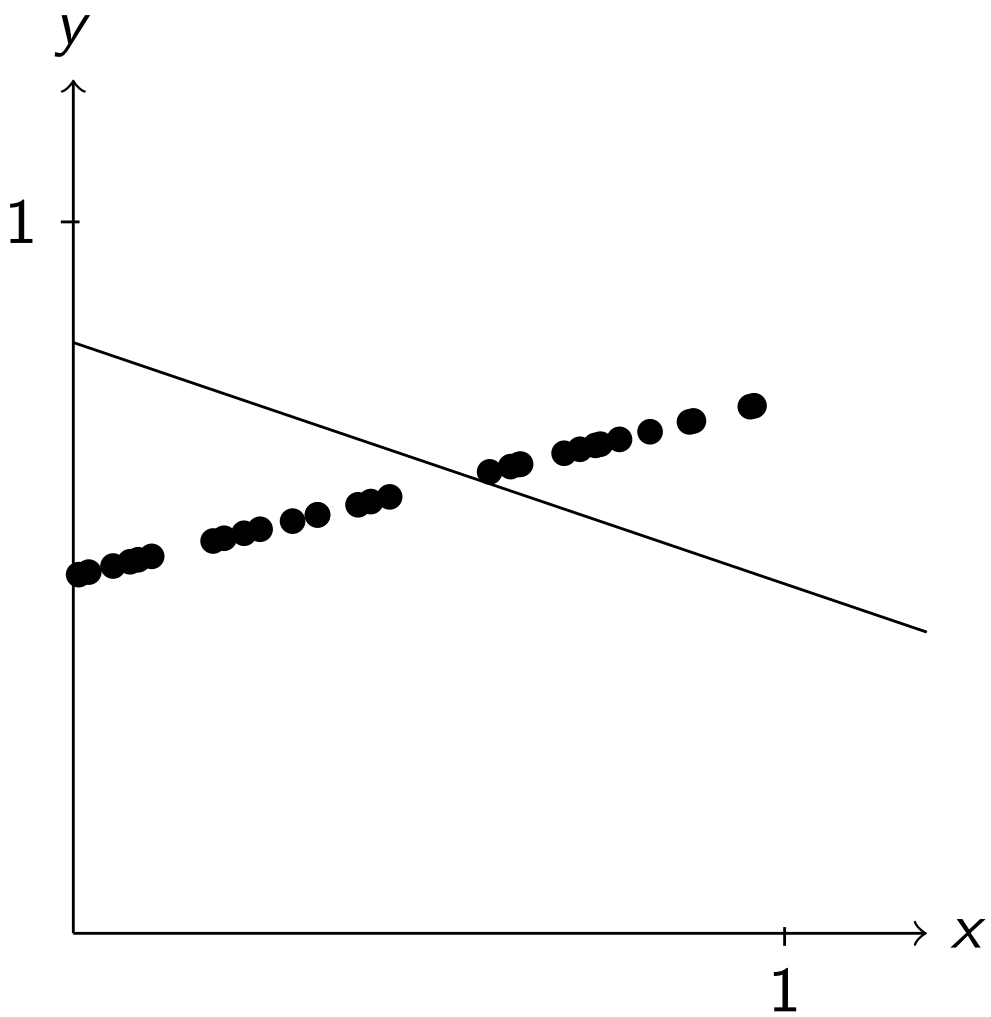

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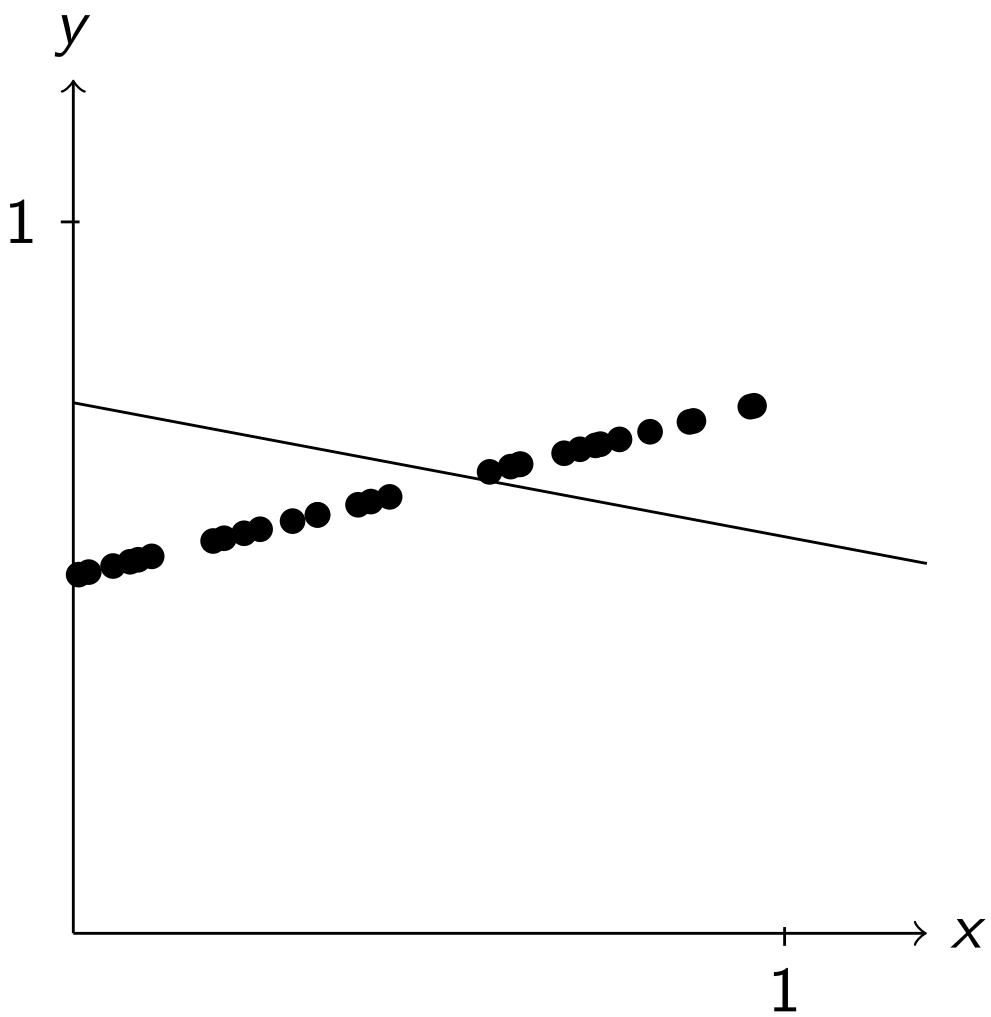

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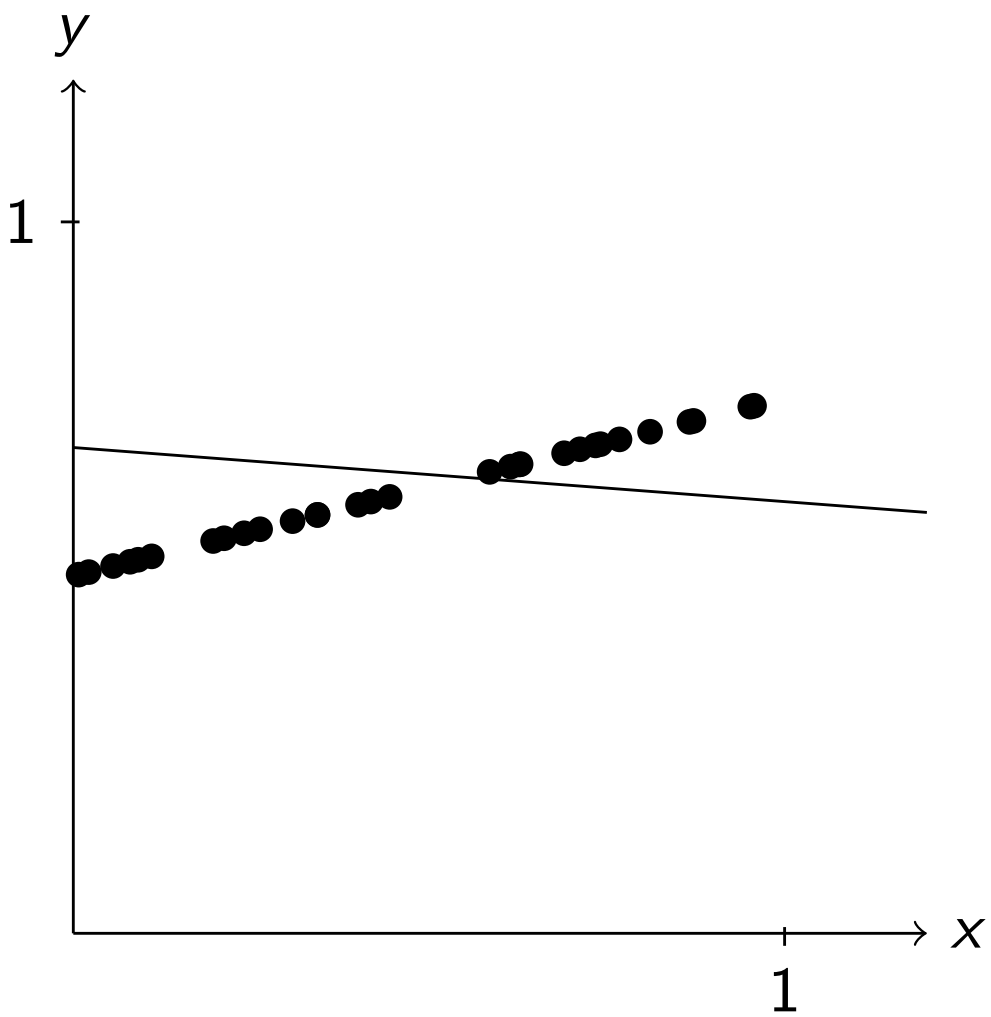

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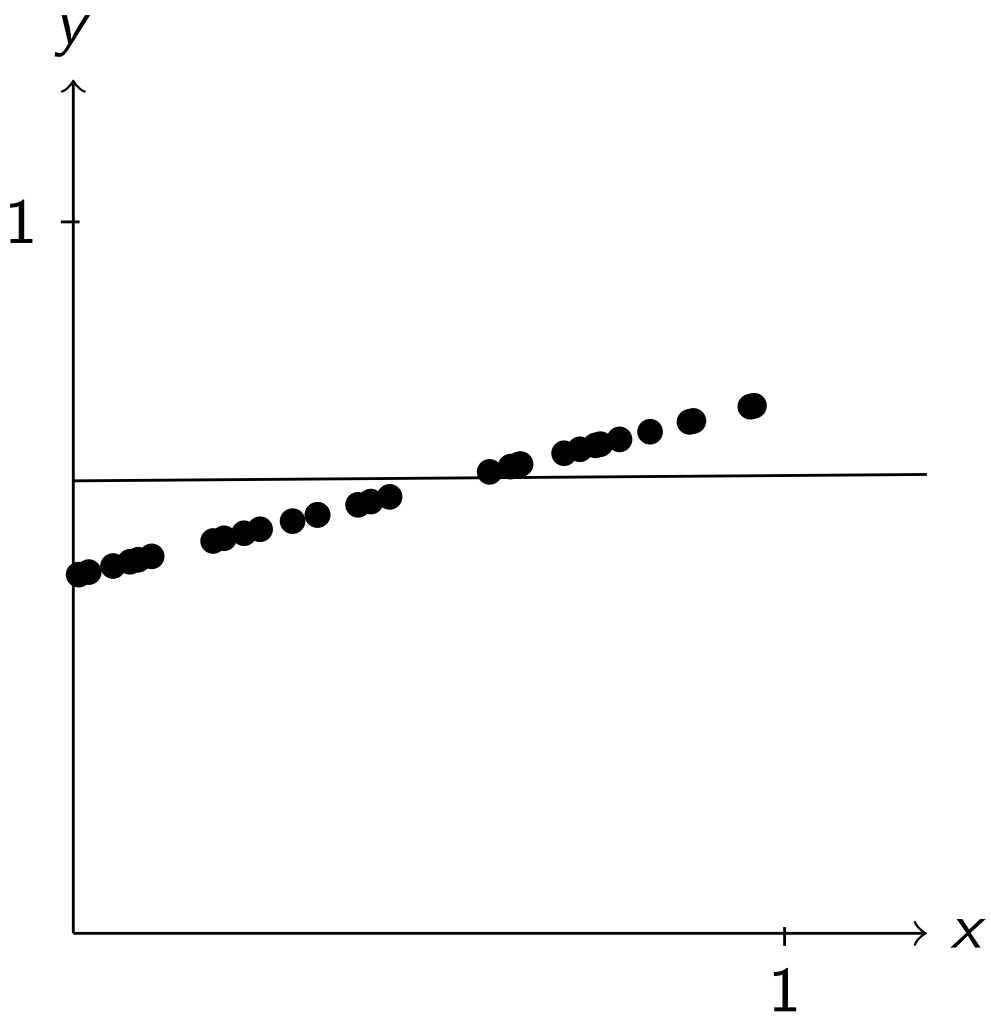

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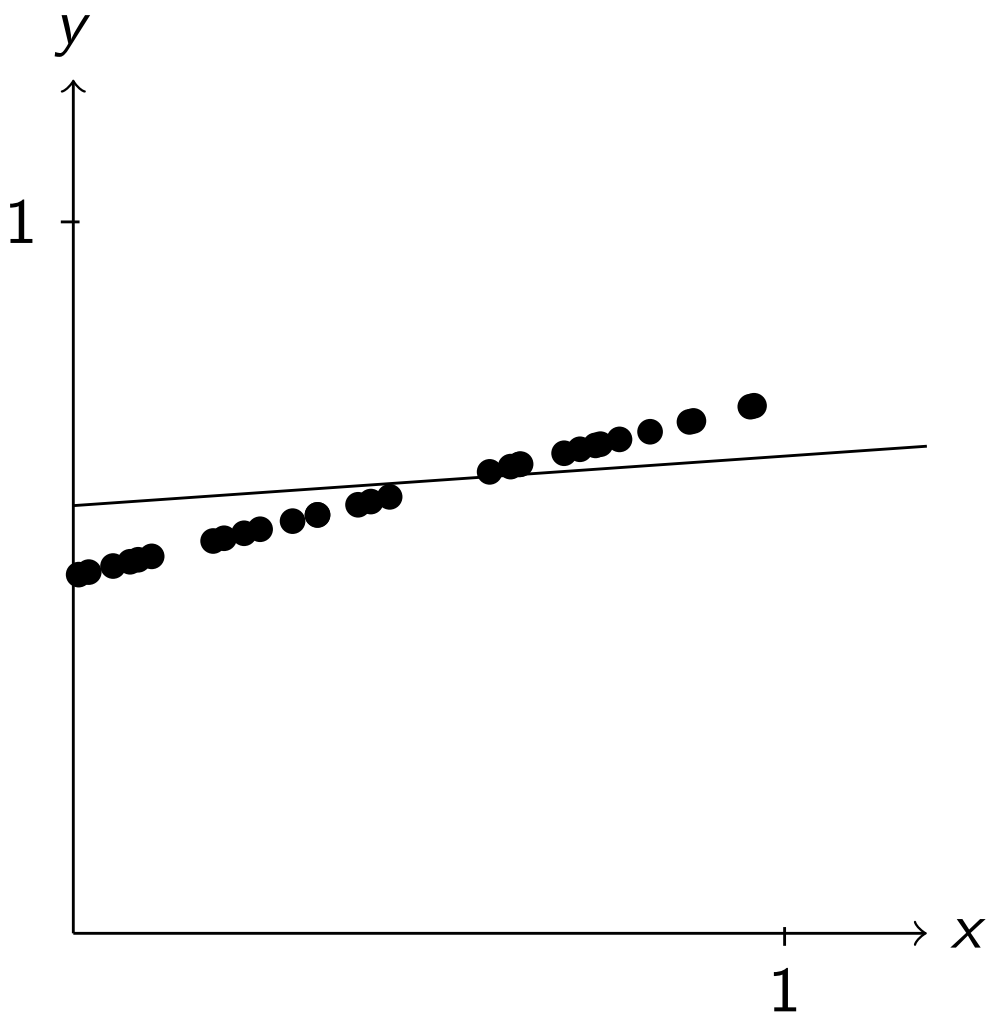

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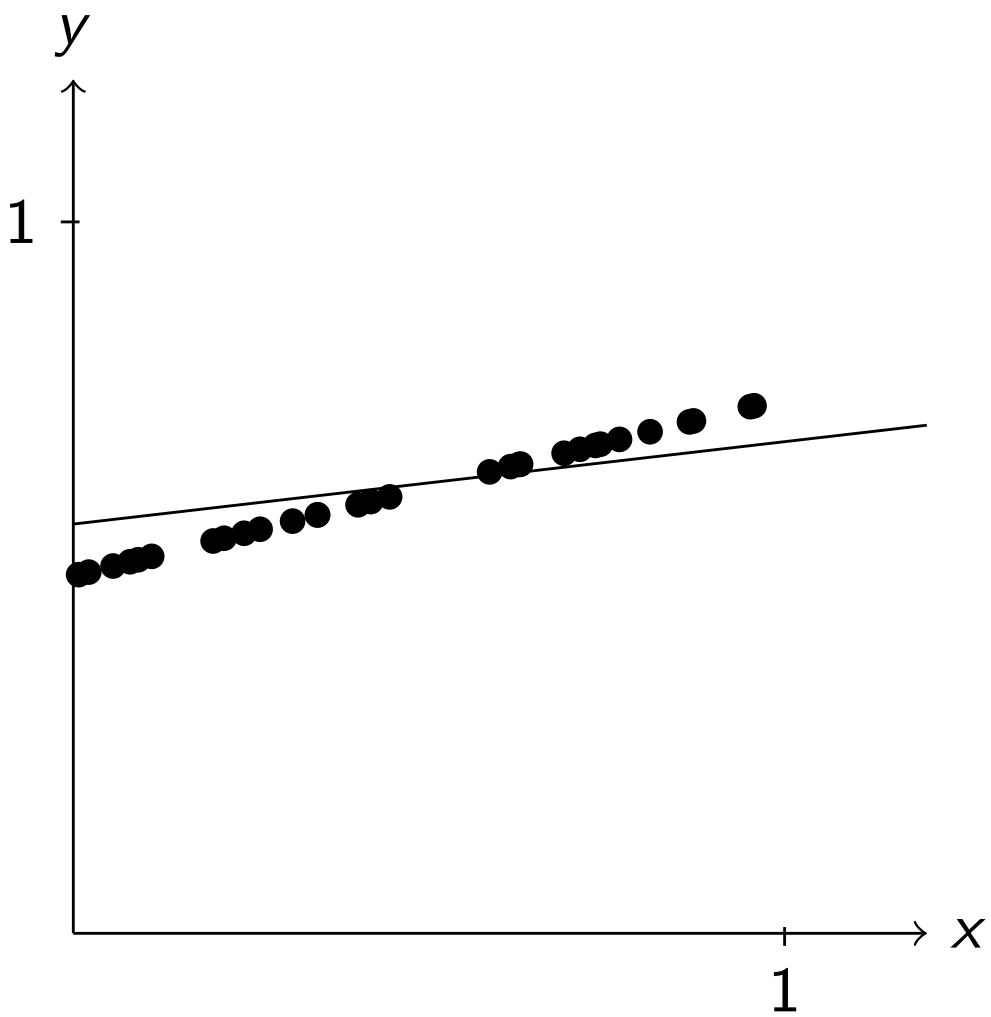

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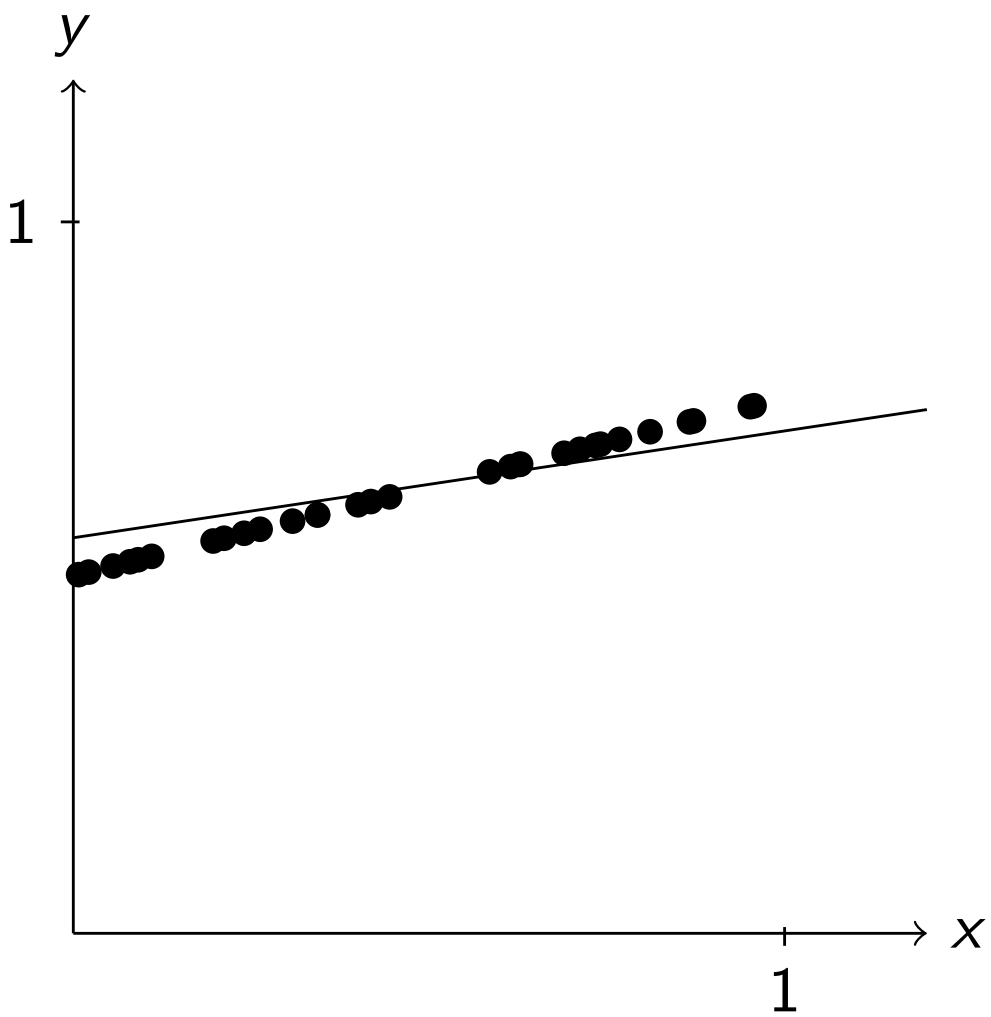

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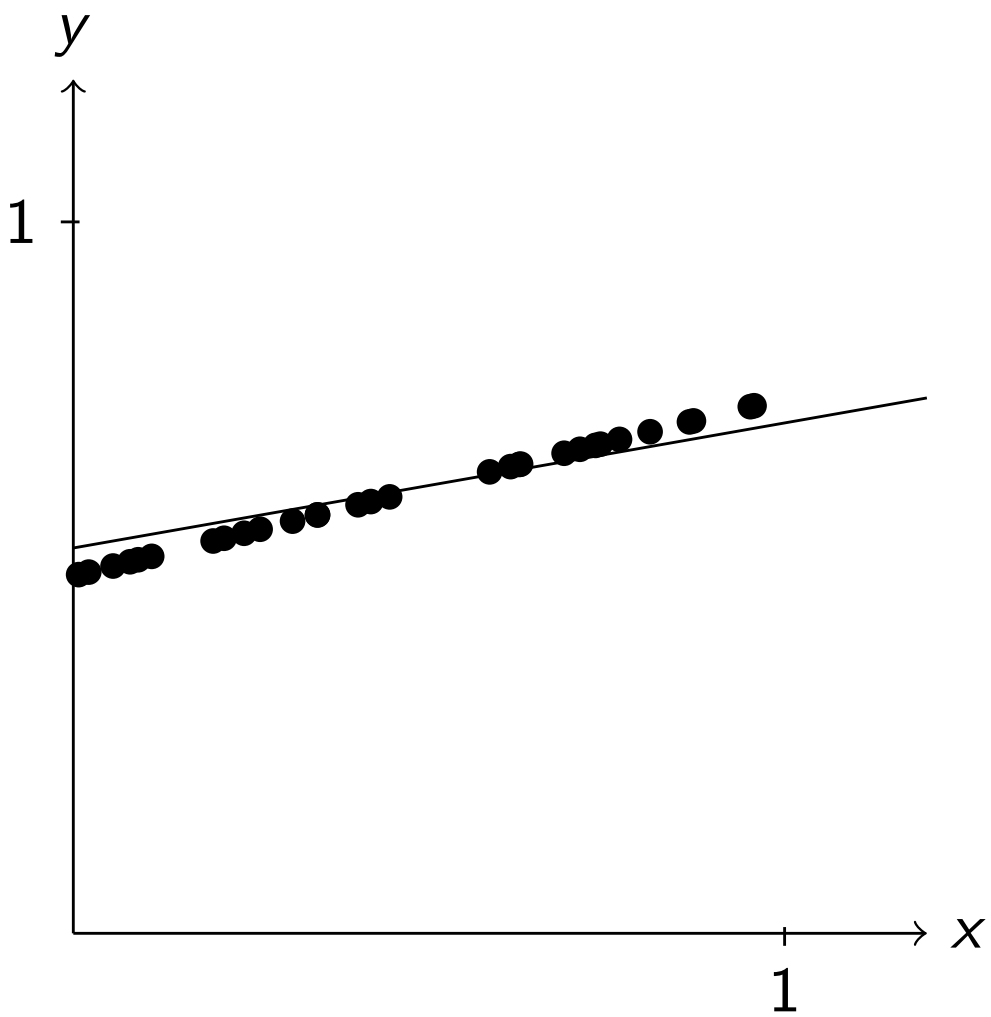

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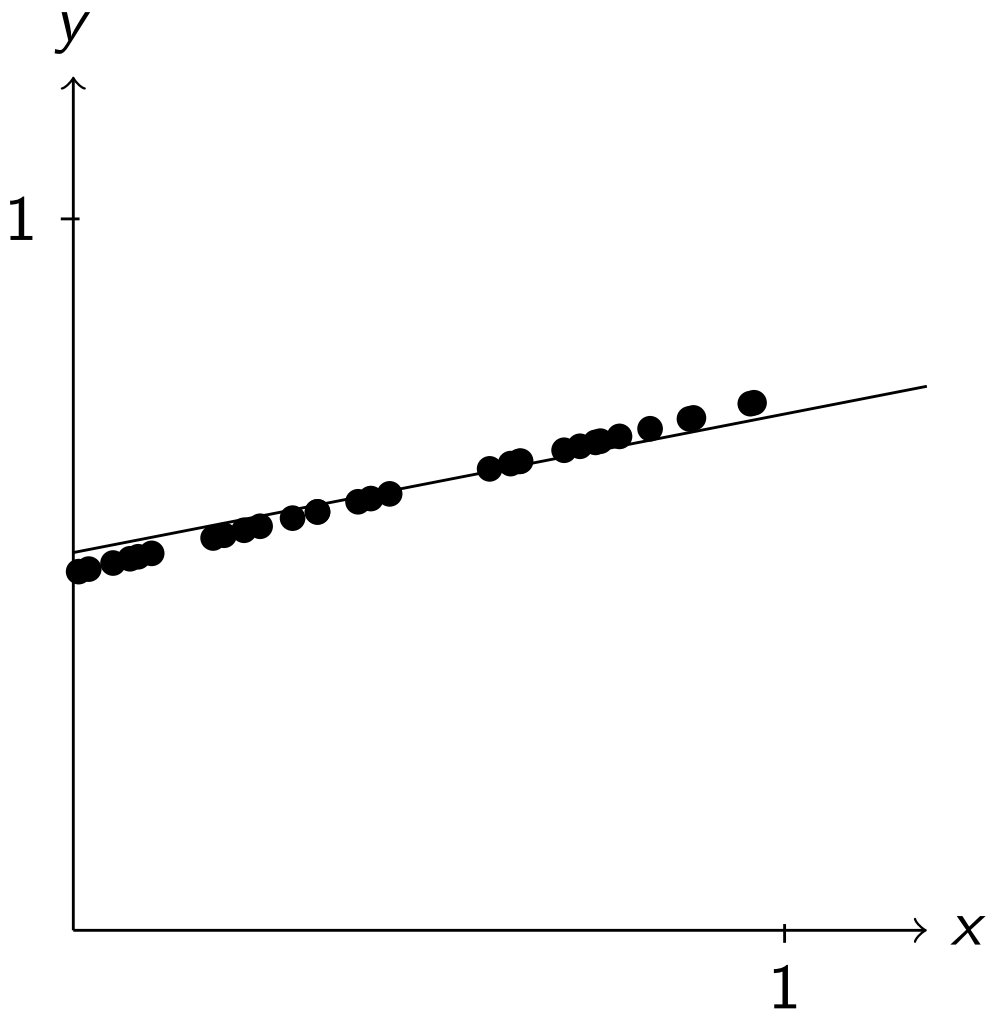

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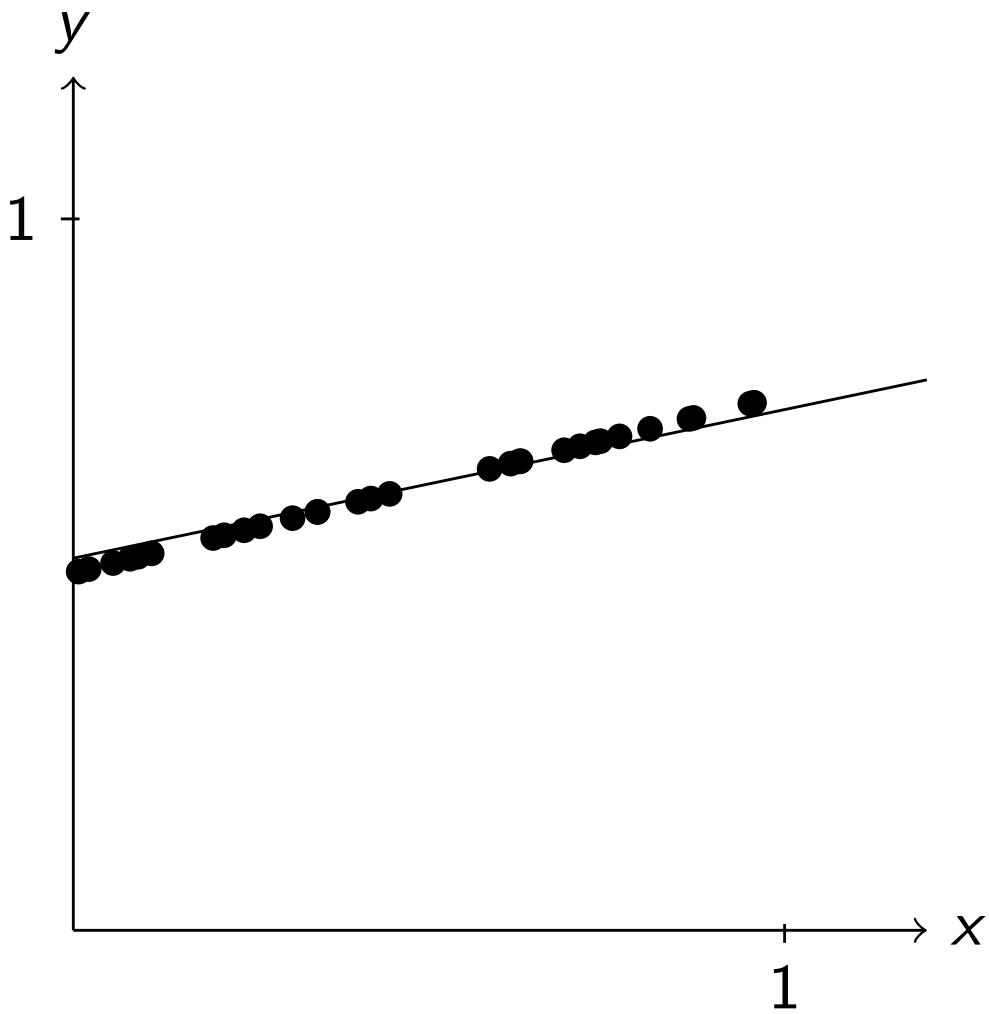

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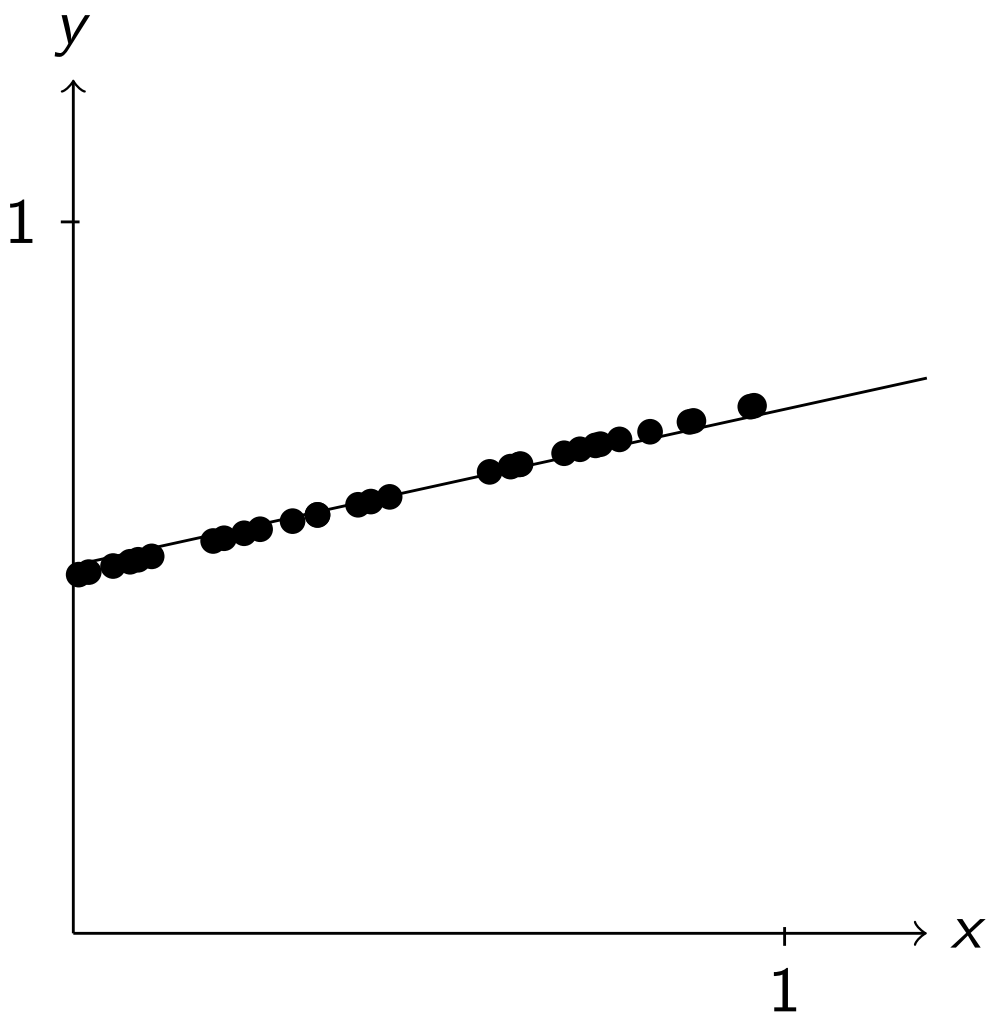

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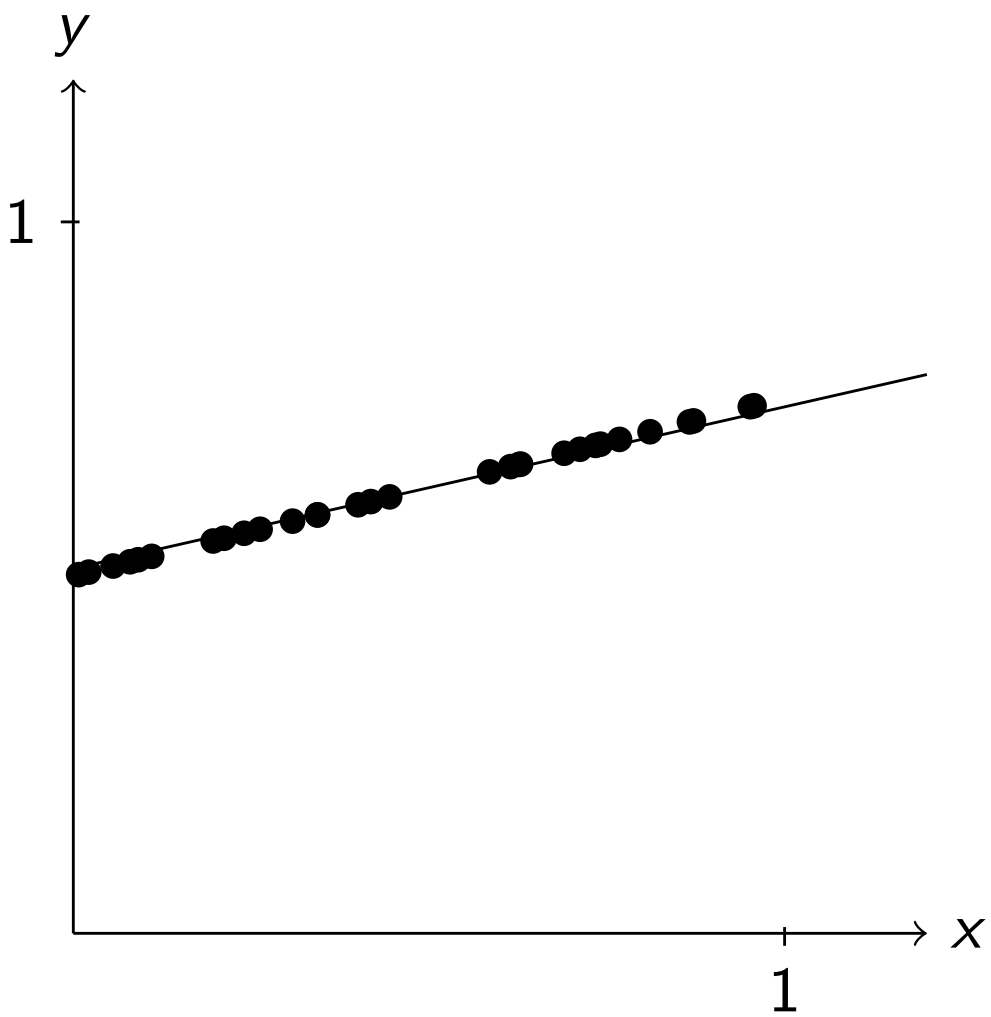

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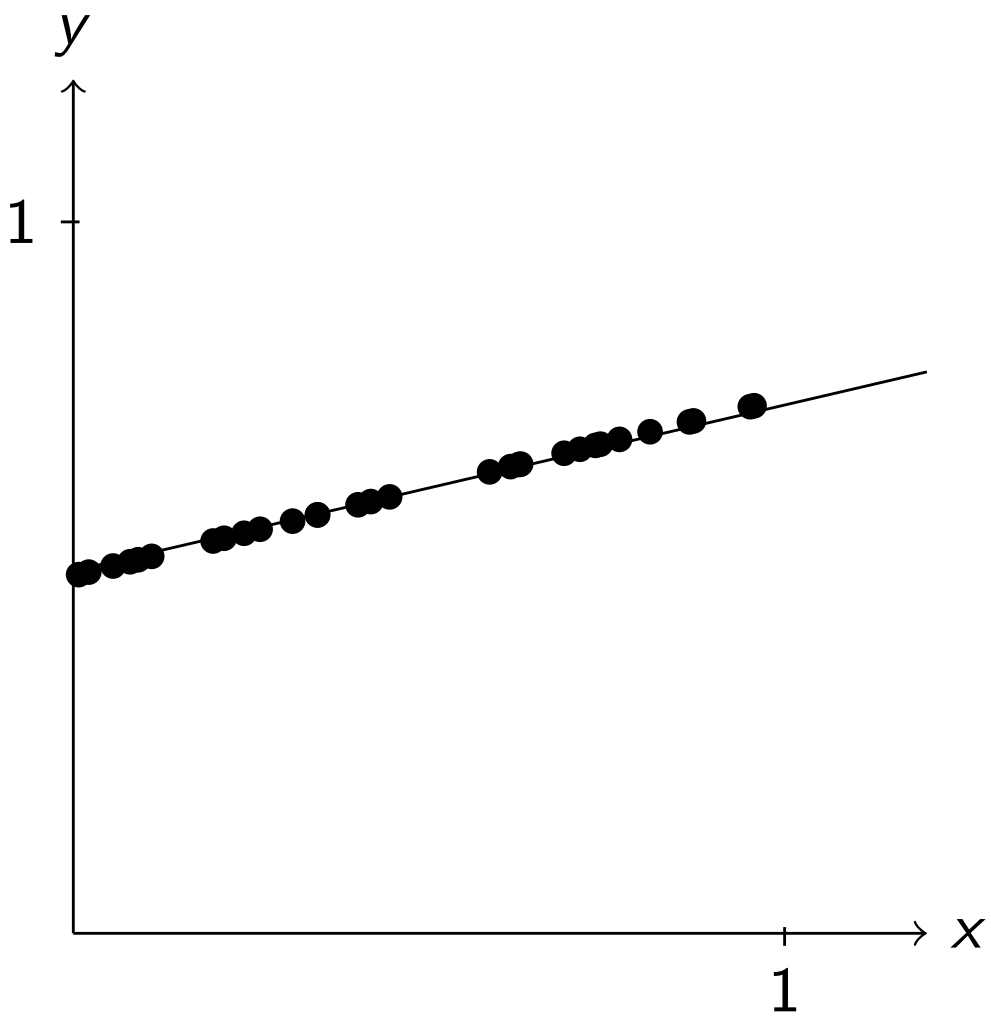

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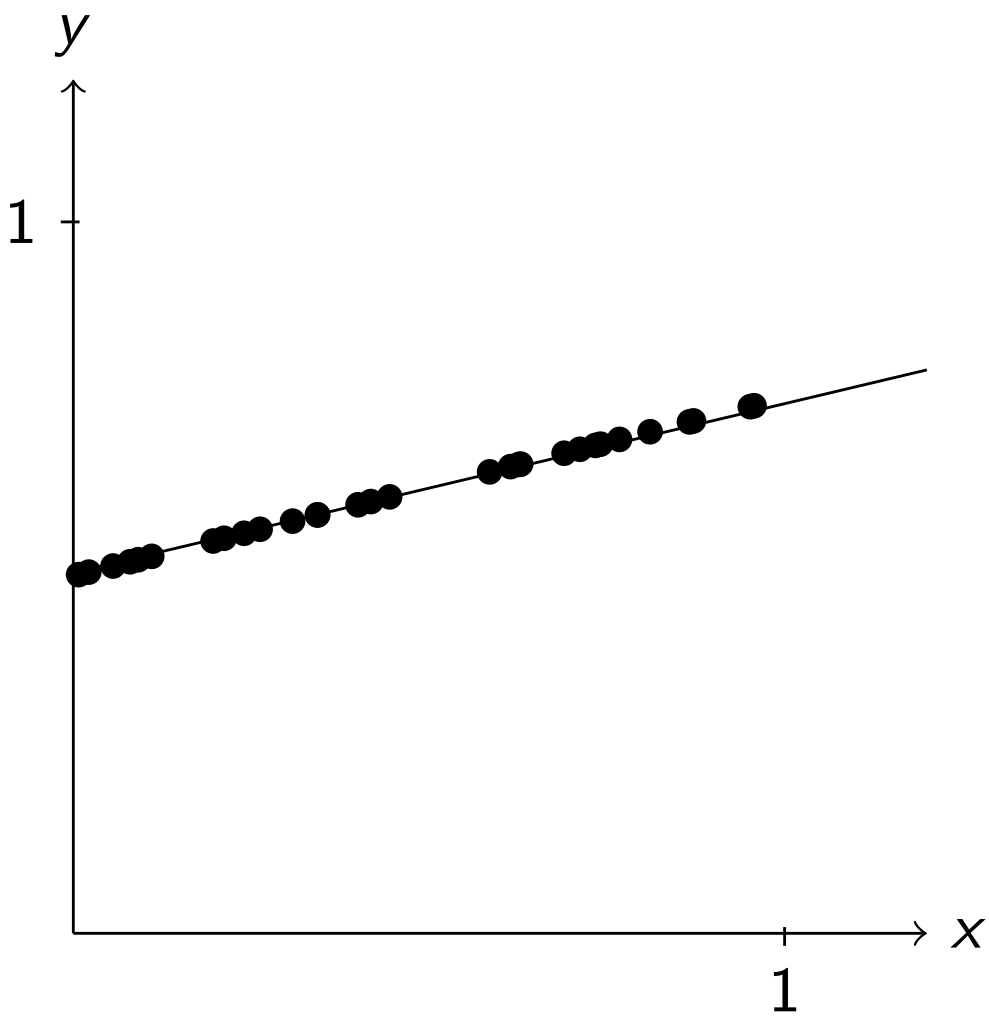

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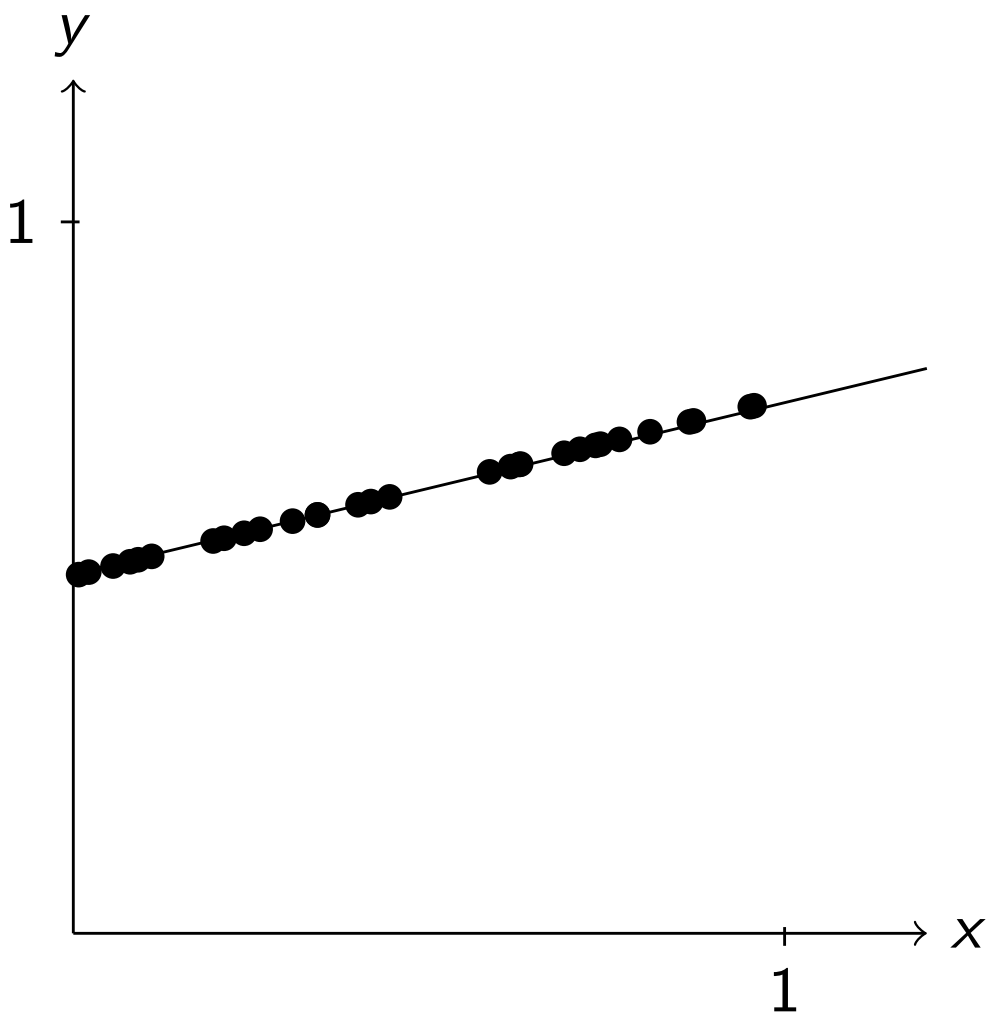

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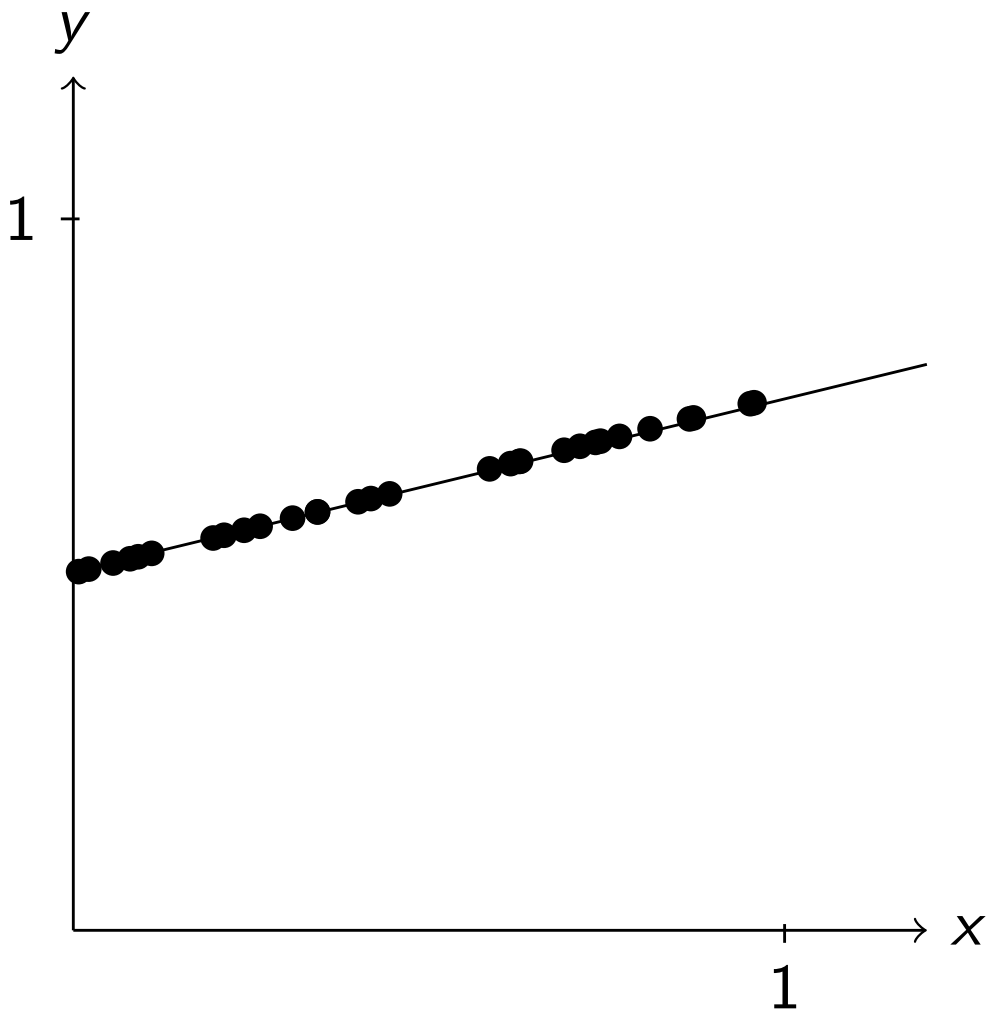
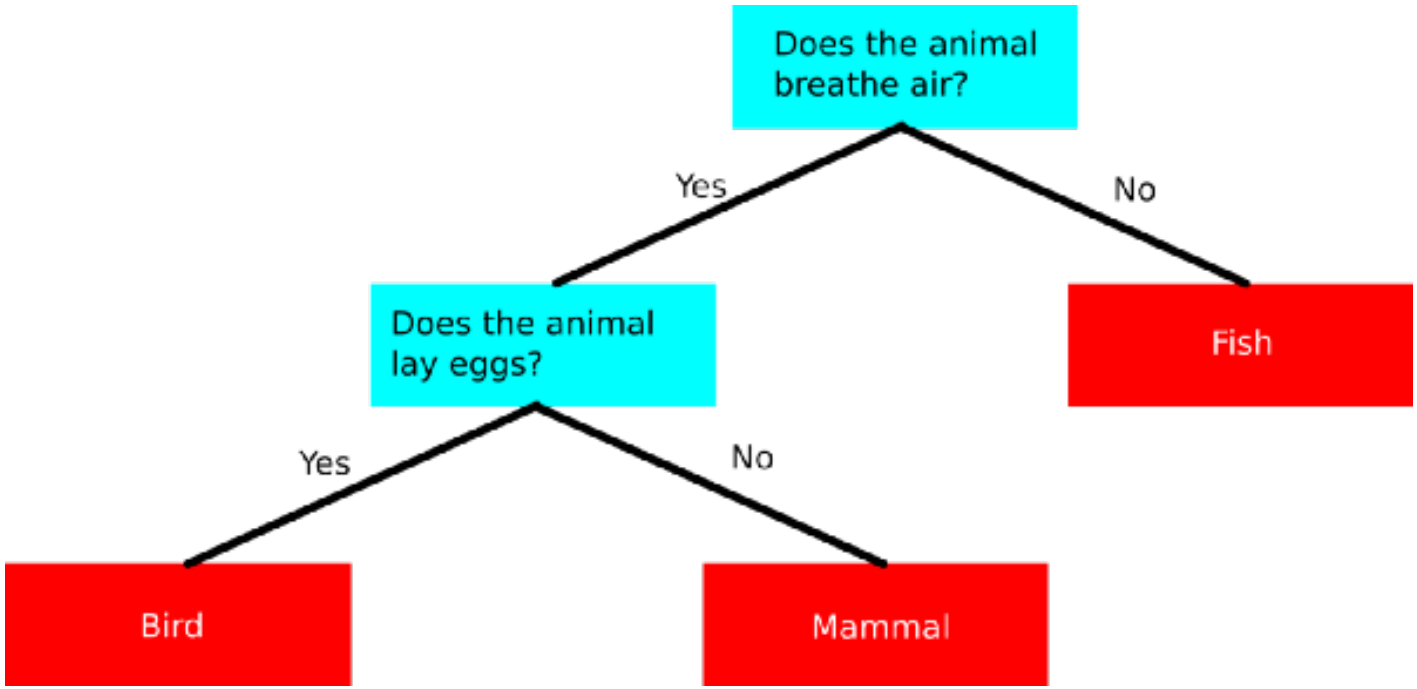


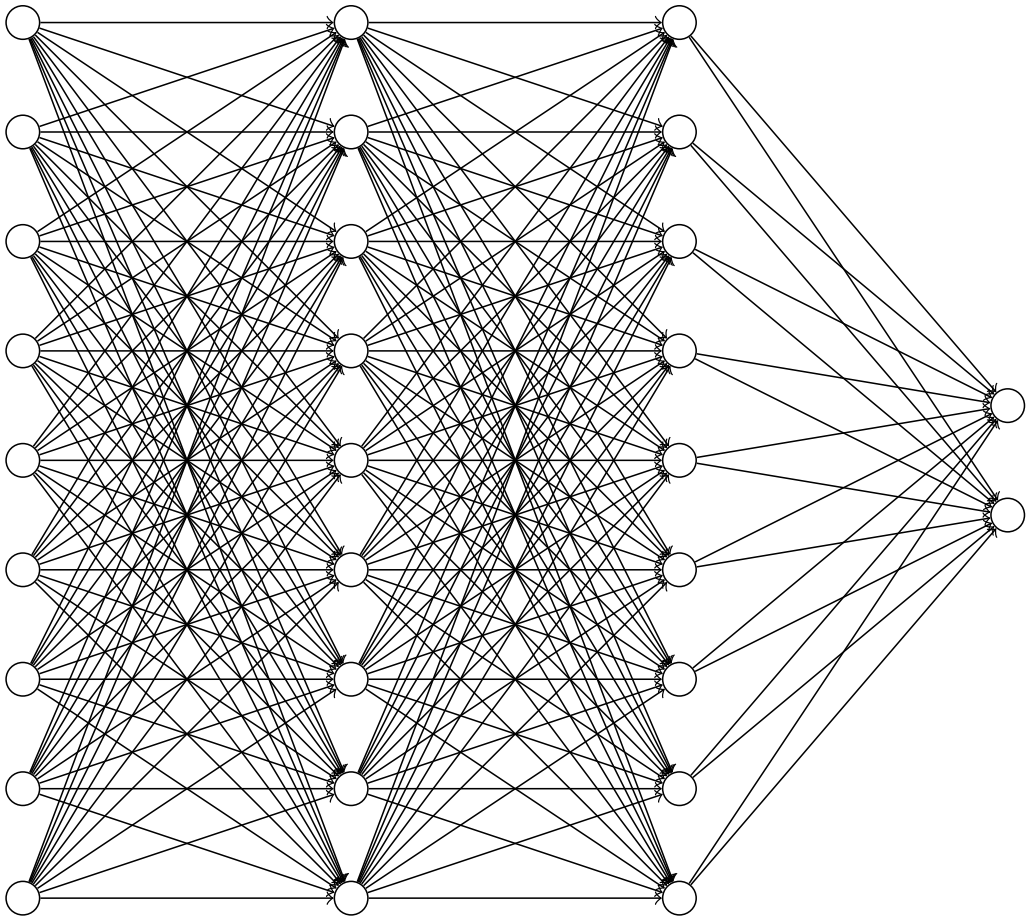
# Model example

## Decision tree



# Model example

## Neural network (deep learning)



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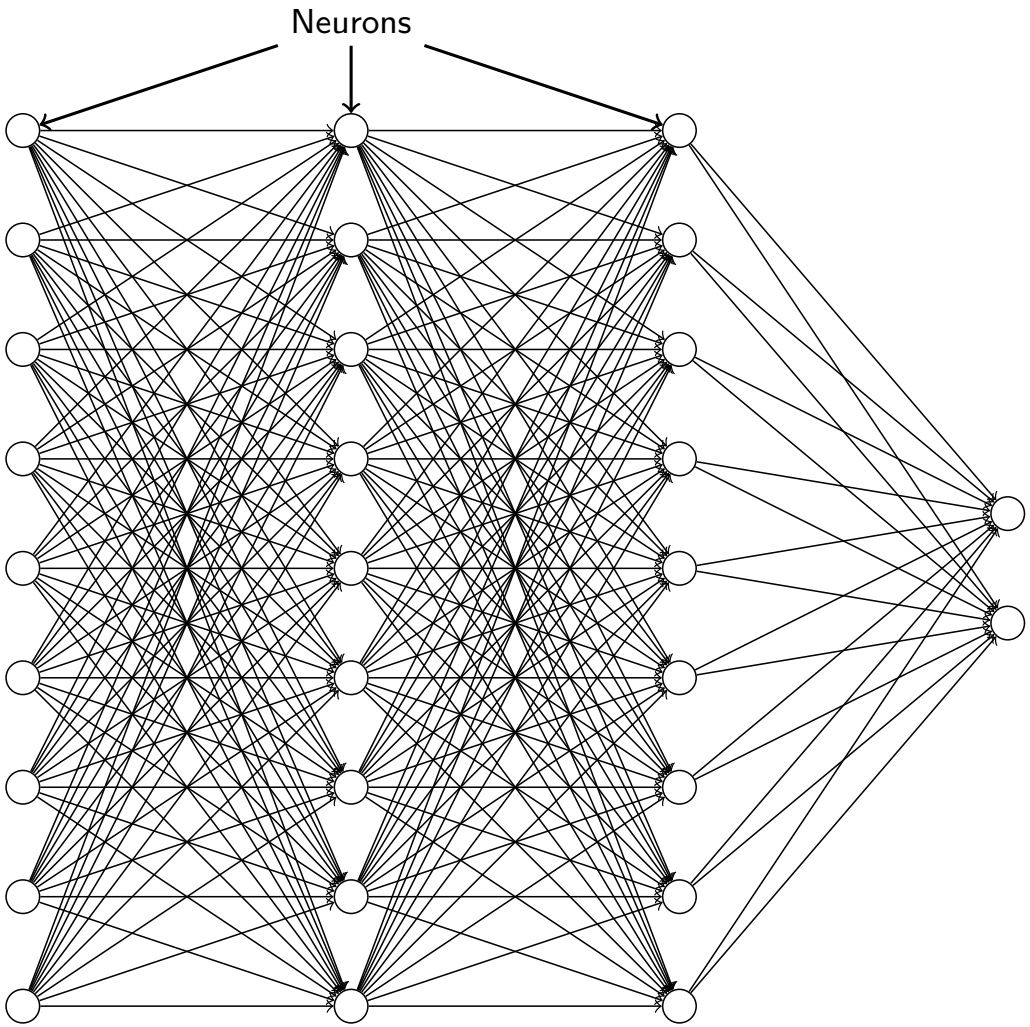

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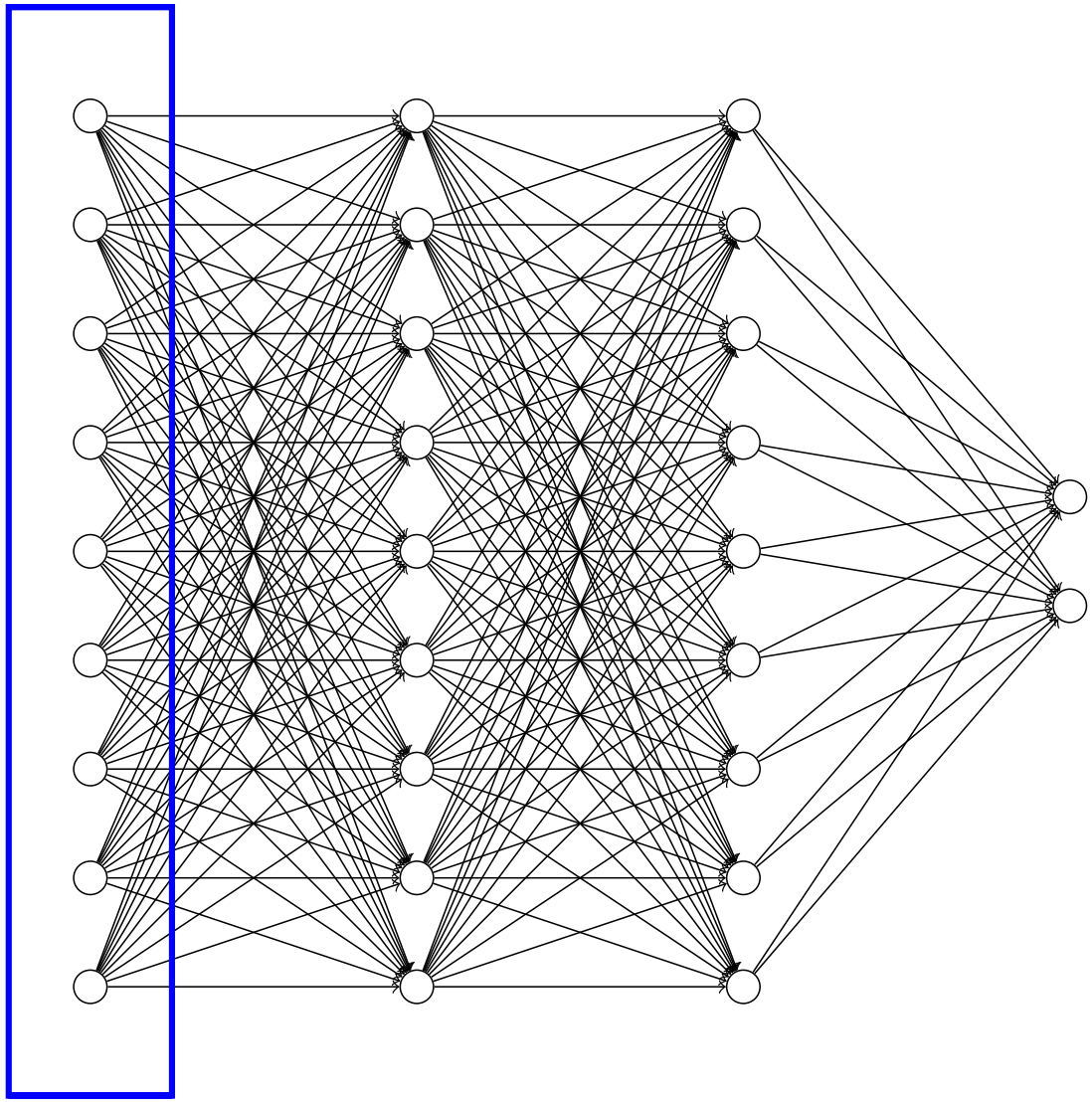
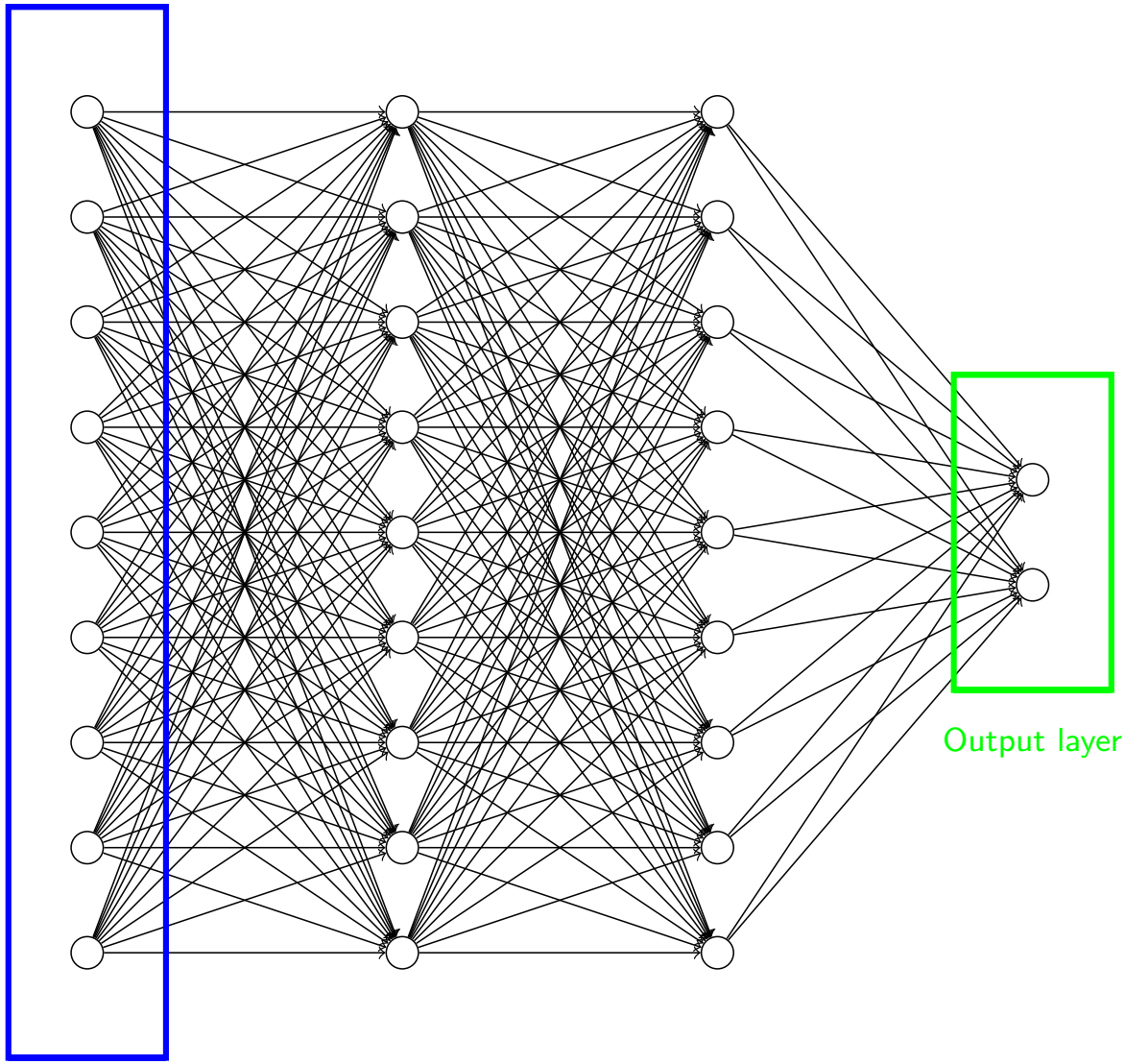
## Neural network (deep learning)



Input layer

# Model example

## Neural network (deep learning)



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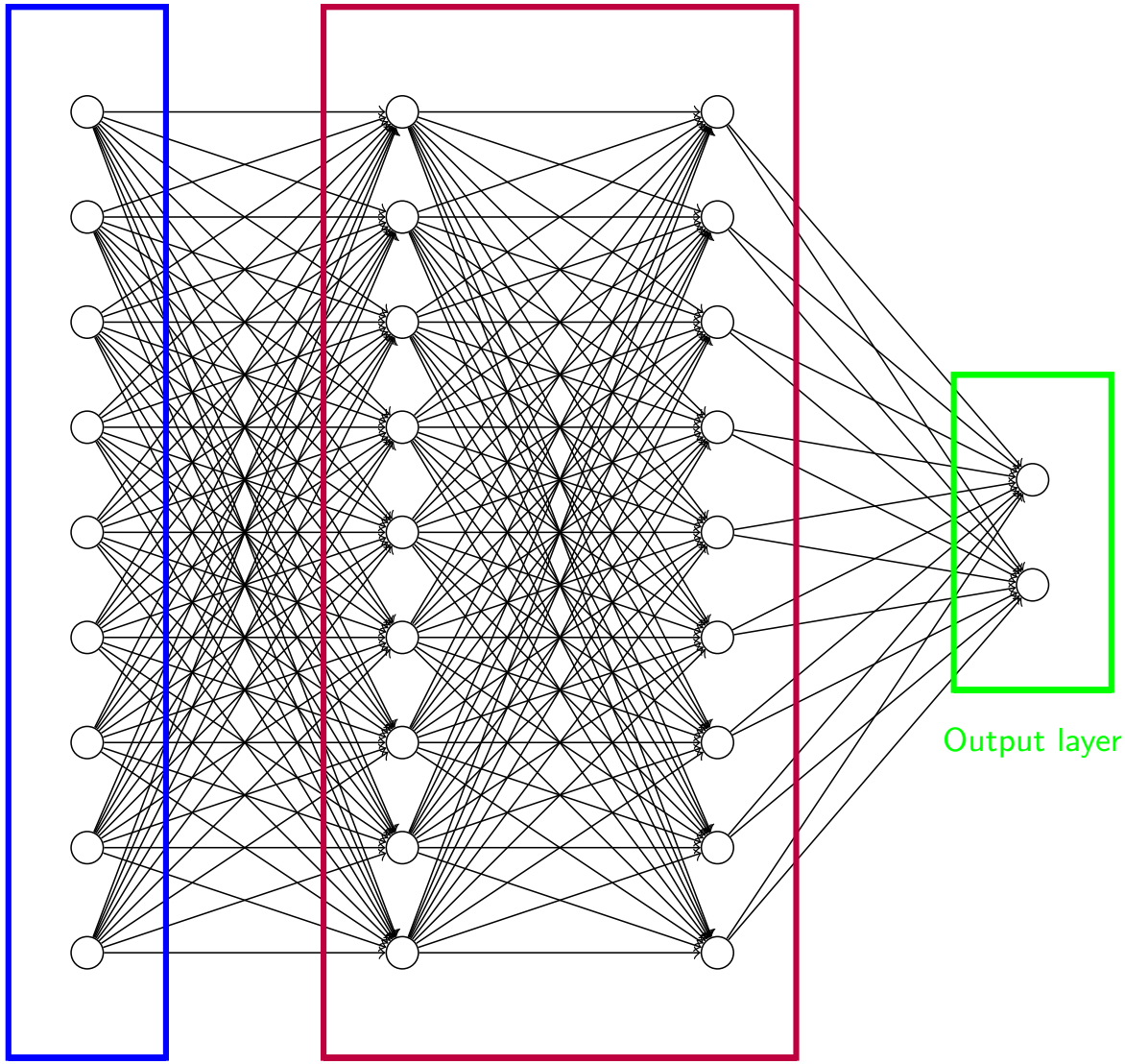
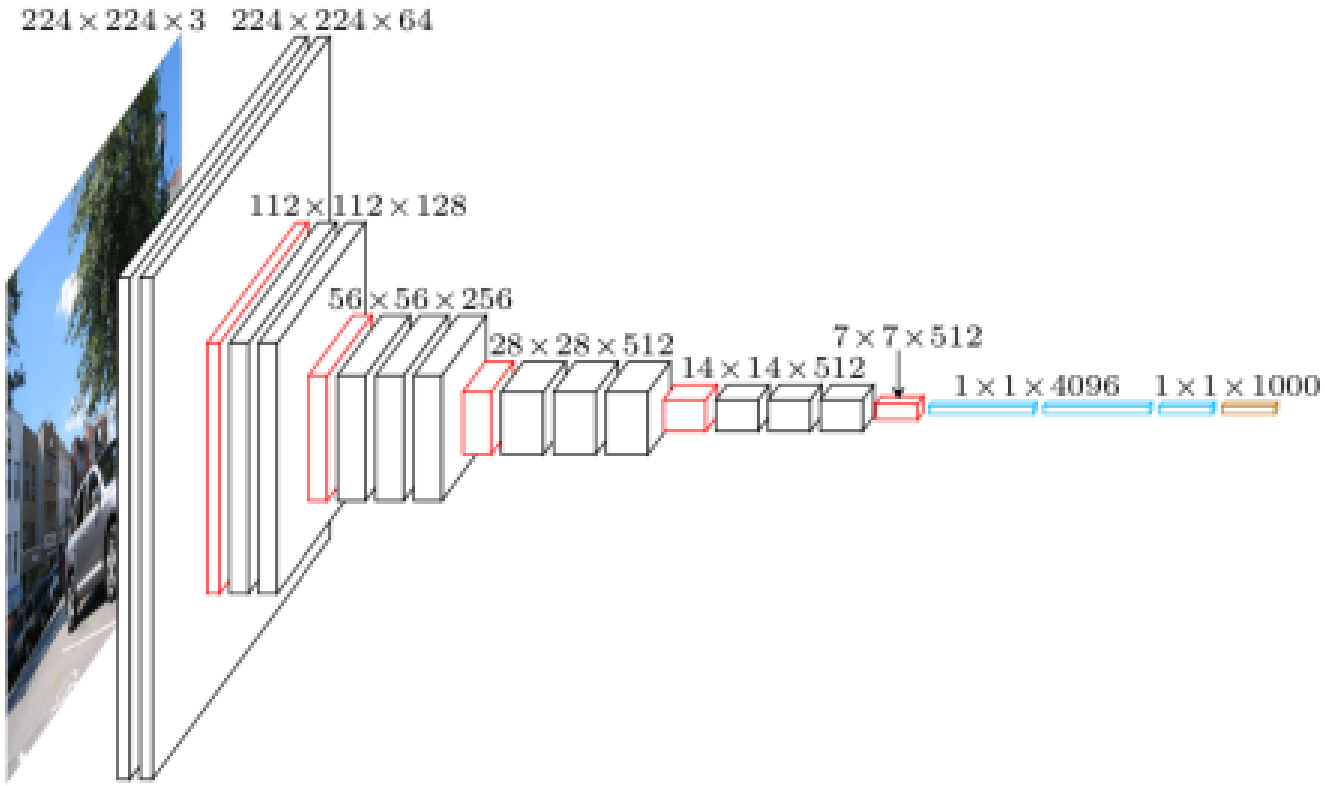
## Neural network (deep learning)



# Deep learning architecture

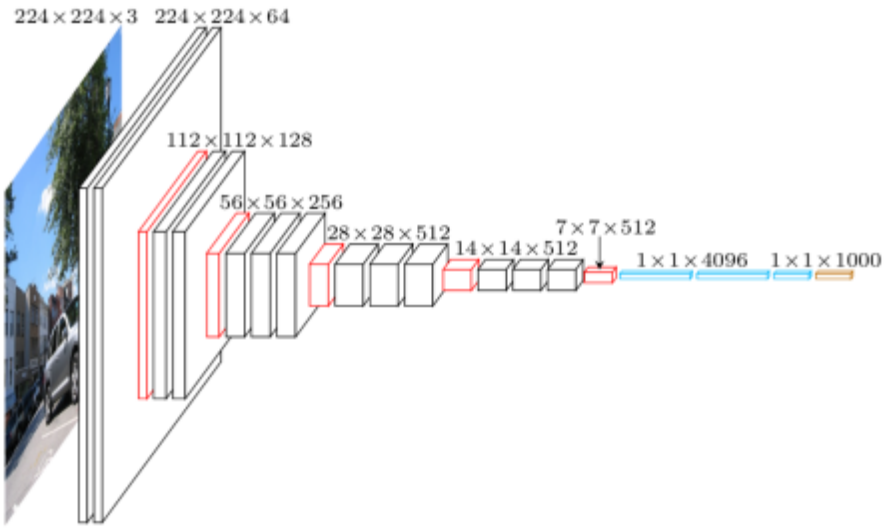
## Image recognition (VGG 16)

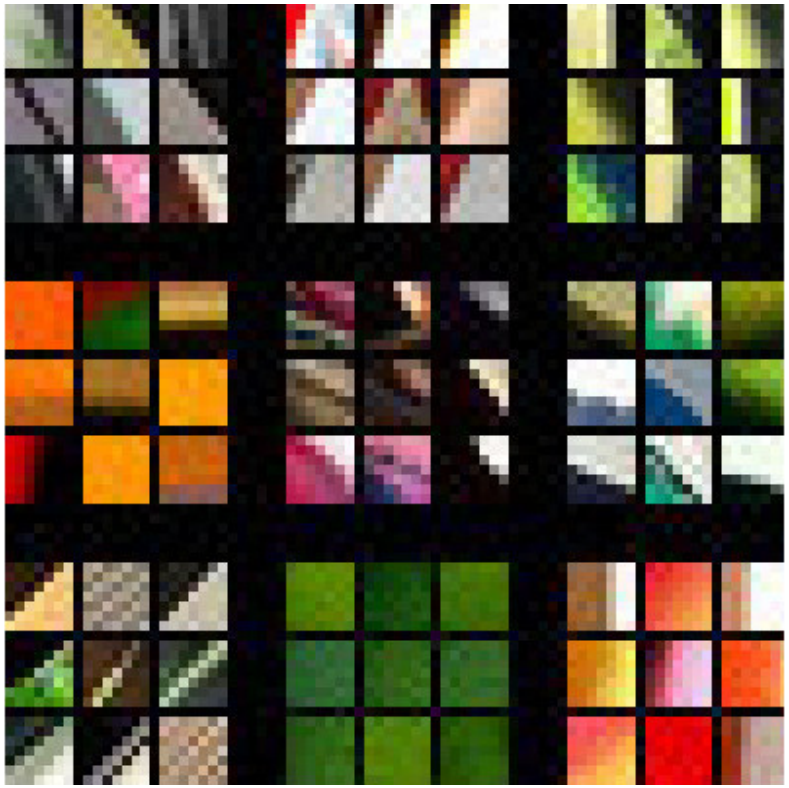


# Deep learning architecture

## Hierarchized pattern recognition

Layer 1

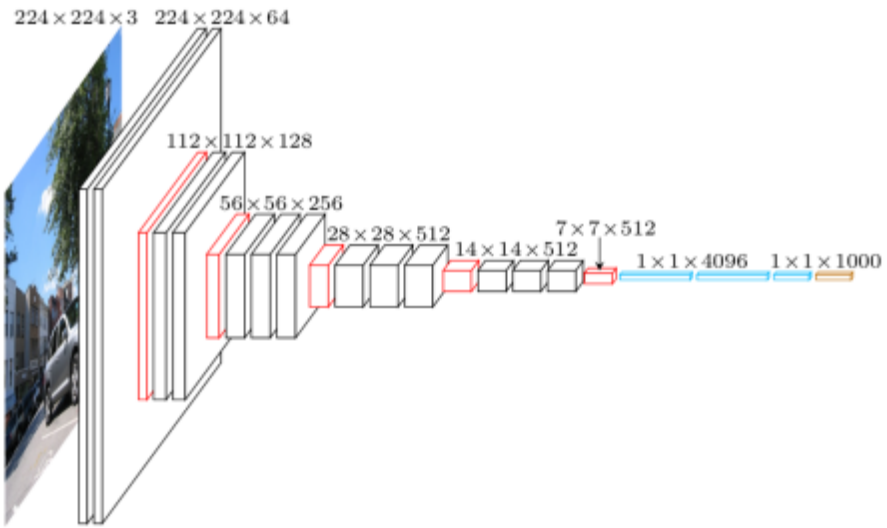


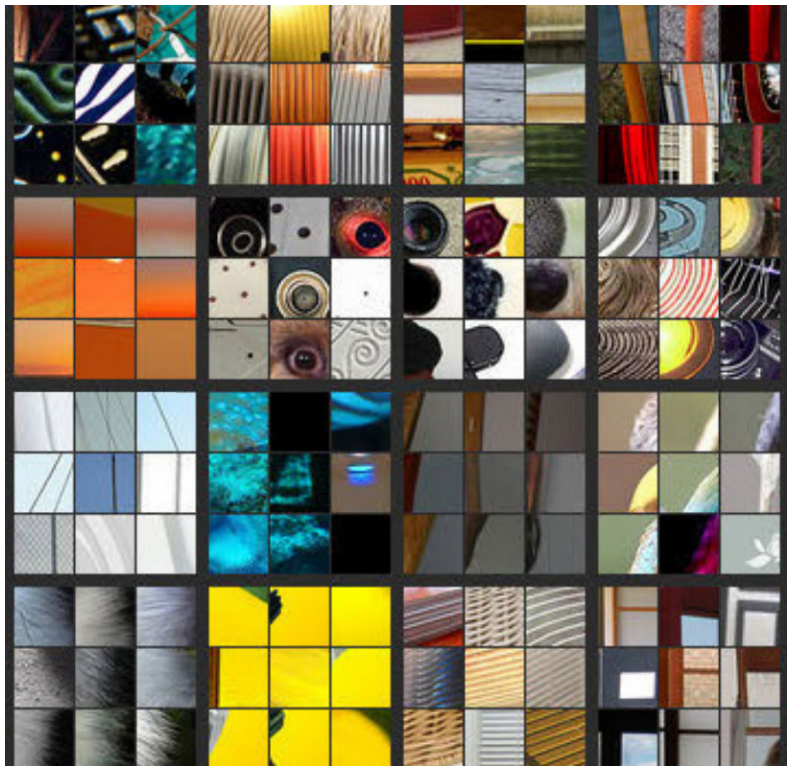



# Deep learning architecture

## Hierarchized pattern recognition

Layer 2

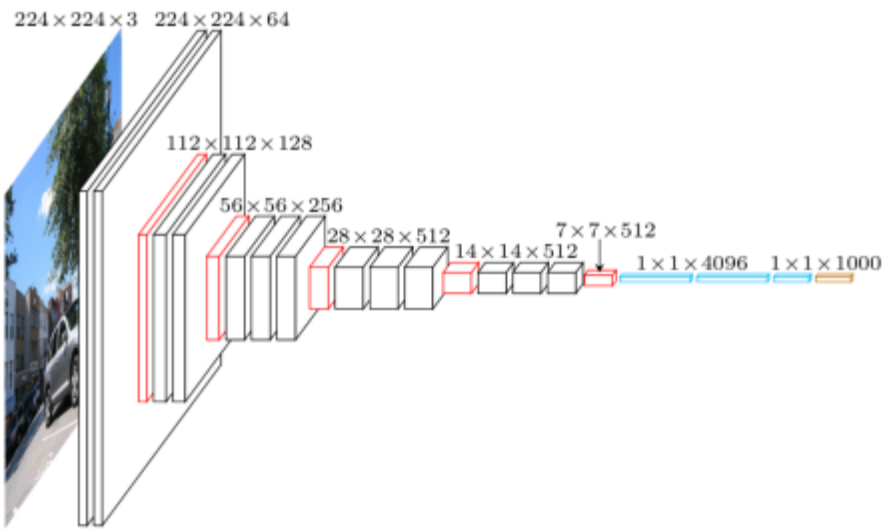


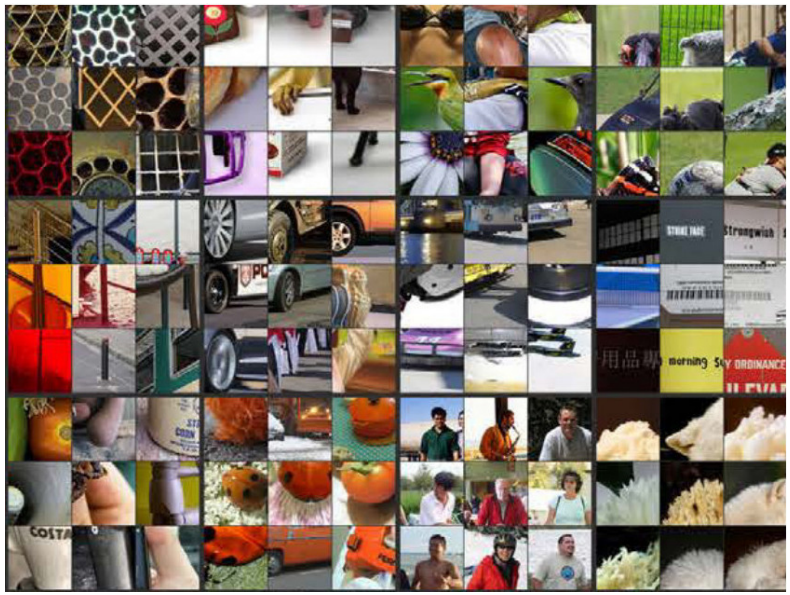



# Deep learning architecture

## Hierarchized pattern recognition

Layer 3

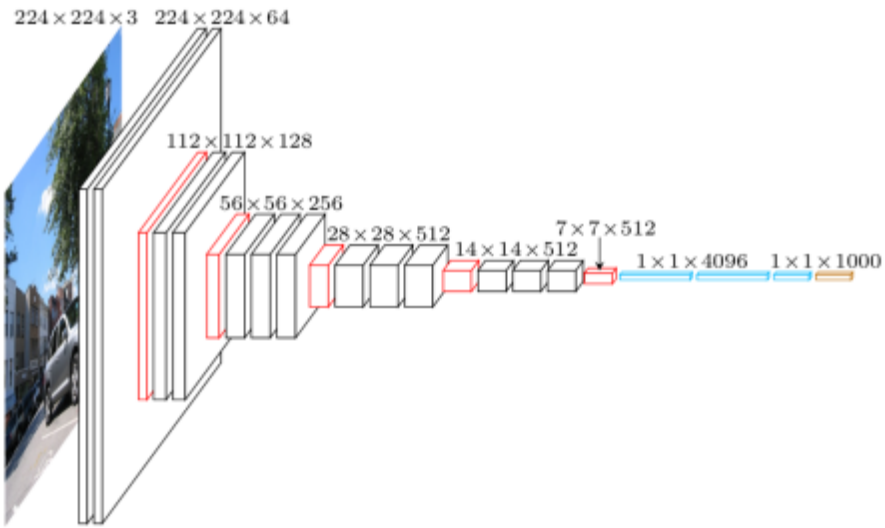


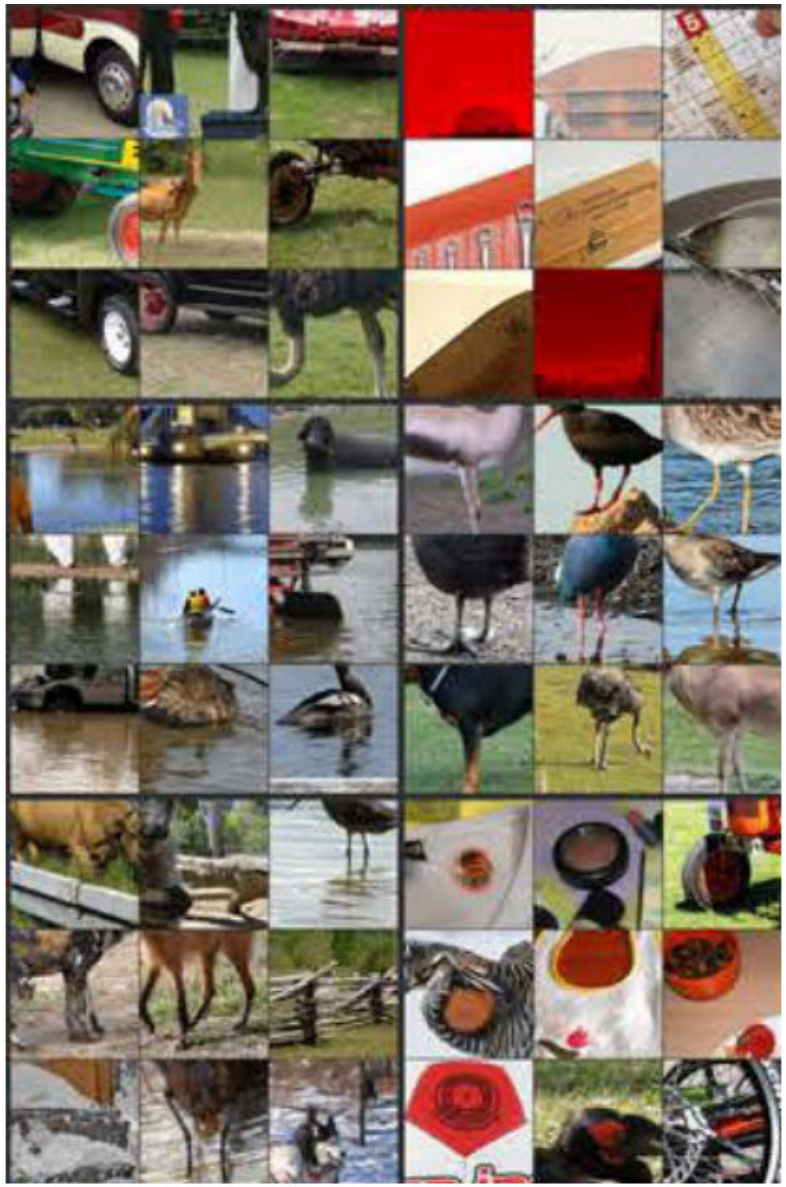



# Deep learning architecture

## Hierarchized pattern recognition

Layer 4

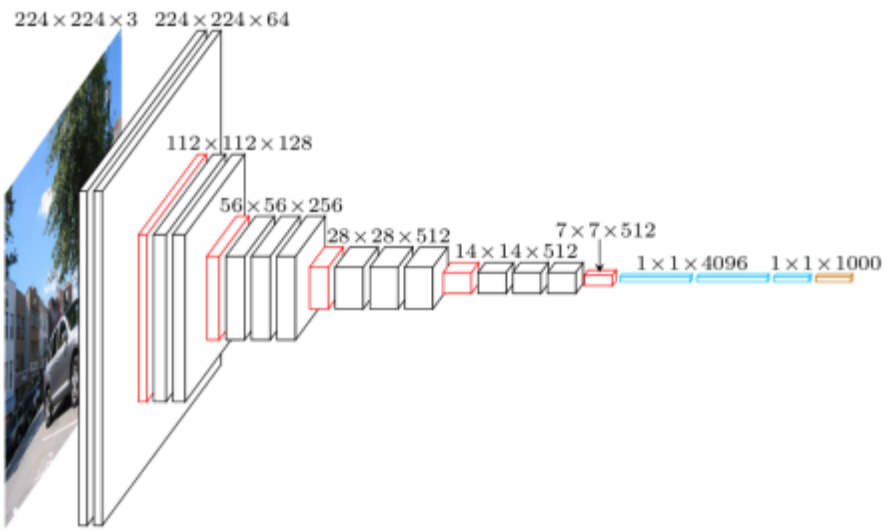


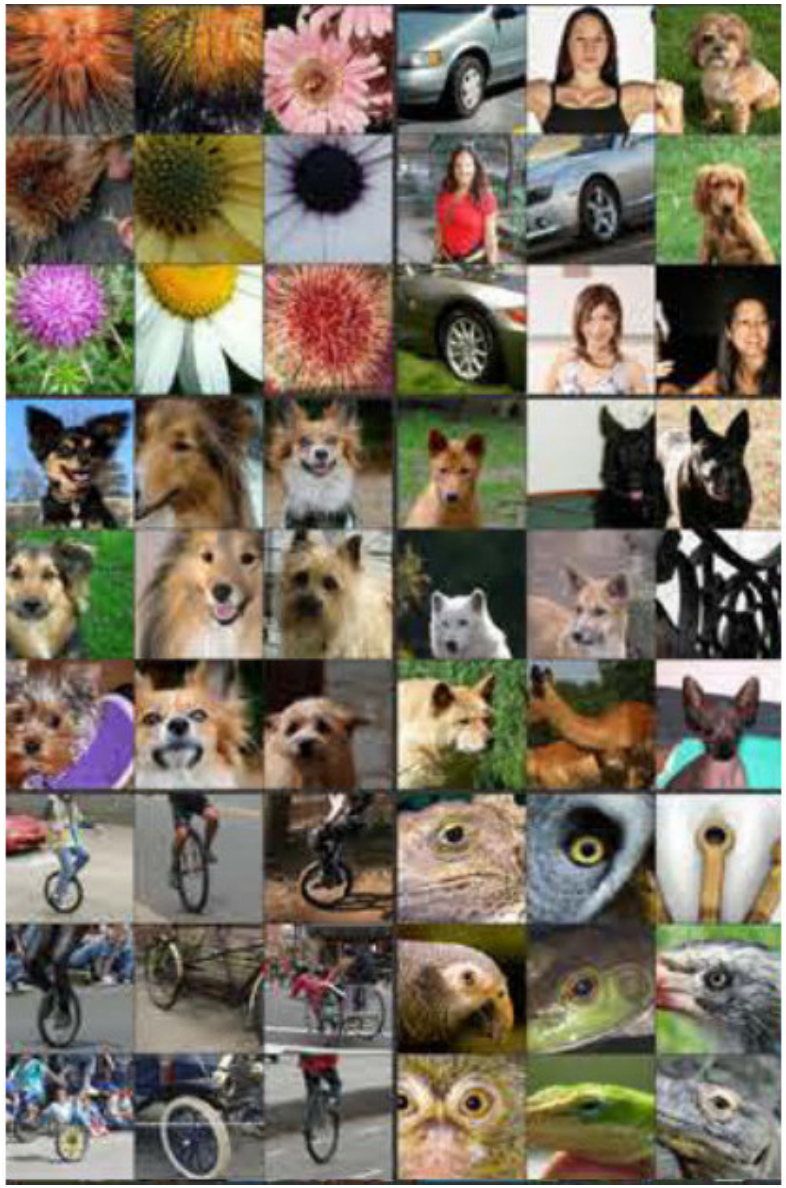



# Deep learning architecture

## Hierarchized pattern recognition

Layer 5



# Application examples

## Supervised learning

- Supervised tasks
  - Regression

    Recommender system — (user, book) → rating

    House price — (surface, nb rooms, city) → price
  - Classification

    Image classification — pixel values → cat or dog

    Text classification — list of words → spam or valid email
- Unsupervised taks
  - Clustering

    Group clients by interests
  - Anomaly detection

    Detect unusual and strange events