Summary – GA
- Genetic Algorithms
- Chromosome (genotype)
- Individual (phenotype)
- Selection (survival of the fittest)
- Inheritance
- Xover (Exploitation)
- Mutation (Exploration)
- Population
- Adaptation @ two levels
- Fitness function/landscape

Summary – ES
- Evolution Strategies
- Chromo = Object (x) + Strategy (σ)
- Small mutations are preferred
- Mutation probabilities are normally distributed
- Recombination
  - local vs global
  - Discrete vs intermediary
- No selection pressure

Summary – Applications
- Systems Identification
- Economic Dispatch
- Time Series Artificial Neural Networks
- Circle Packing
- Hidden Markov Models

Summary – Applications
- Representation – not always straightforward
- Fitness Function – not always cheap
- Constrained Optimization
  - punishment vs. repair
  - wasting CPU cycles – getting nowhere
- Automated production of models
Summary – CGA
- Solves binary-encoded problems
- D reals representation
- Encodes probabilities of having a 1 in that gene

Summary – DE
- Real-valued problems
- Vector representation
- Difference-based mutation
- Xover
- One-to-one survivor selection DE/x/y/z
  - X denotes how we choose the base vector.
  - Y denotes the number of difference vectors (think minus signs).
  - Z denotes the cross over method.

Summary – DE

Summary – PSO
- Swarm intelligence
- Vector representation
  - Position
  - Previous best position
  - Velocity
- Behavioral components
  - Social (global)
  - Cognitive (personal)
- No selection, no replacement, no Xover
- Velocity modulation
  - Inertia
  - Constriction

Summary – MA
- We just saw them
- No need to repeat

Conclusions
- EC = Optimizers
- Can deal with systems:
  - Non-differentiable
  - Discontinuous
  - Hybrid
  - Restrictions (forbidden regions)
- Curse of dimensionality
- Like every book and course “Intro to …”
- Genetic Programming
  - Linear GP
  - Koza’s GP (tree-based)
  - Gene Expression Programming (linear encoding)