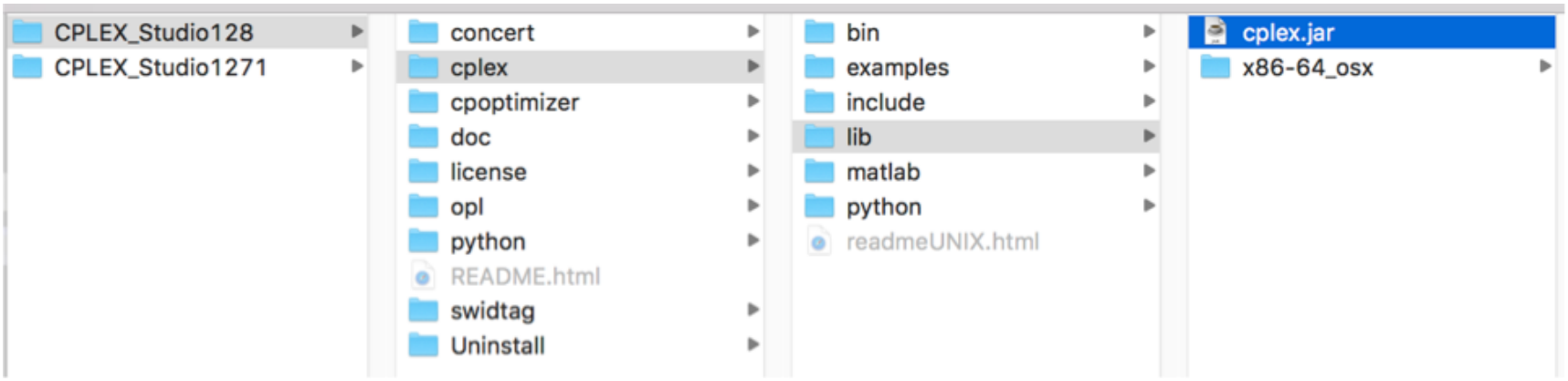
Agenda

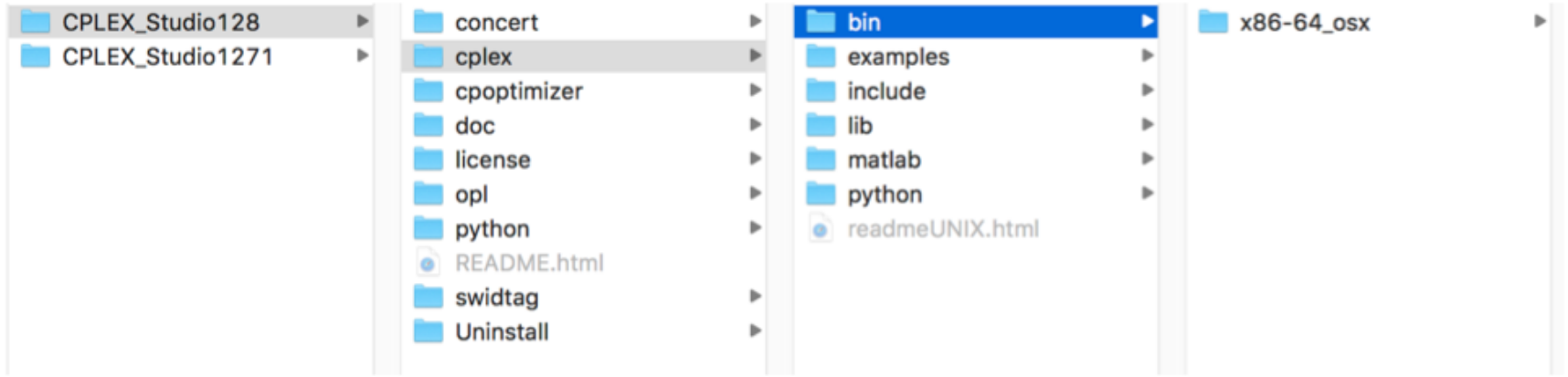
- Basics of Stochastic Programming
- Mathematical Modeling
- Introduction to GAMS
- Programming with GAMS
- **Introduction to CPLEX**
- Programming with CPLEX

Introduction to CPLEX

- Project → Properties → Java Build Path → Libraries → Add External Jars



- cplex.jar → Native library location → Edit



Introduction to CPLEX

```
import ilog.concert.*;
import ilog.cplex.*;
static public class Application {
 static public main(String[] args) {
   try {
    IloCplex cplex = new IloCplex();
    // create model and solve it
   } catch (IloException e) {
     System.err.println("Concert exception caught: " + e);
   }
  }
 }
```

Introduction to CPLEX

- Declaring a variable:
  - One dimensional:
    - IloNumVar x[] = cplex.numVarArray(3, 0, Double.MAX_VALUE);
  - Multi dimensional:
    - IloNumVar x[][] = new IloNumVar[3][];
    - for(int i=0; i<3; i++)
      - x[i] = cplex.numVarArray(3, 0, Double.MAX_VALUE);

- If the variable is an integer:
  - One dimensional:
    - IloIntVar x[] = cplex.intVarArray(JJ, 0, Integer.MAX_VALUE);
    - IloIntVar x[] = cplex.boolVarArray(3);
  - Multi dimensional:
    - IloNumVar x[][] = new IloNumVar[3][];
    - for(int i=0; i<3; i++)
      - x[i] = cplex.intVarArray(3, 0, Integer.MAX_VALUE);

Introduction to CPLEX

- Decision Expressions and Constraints;
  - IloLinearNumExpr cs1 = cplex.linearNumExpr();
  - cs1.addTerm(1, x[0]);
  - cs1.addTerm(-2, x[1]);
    - cplex.addGe(cs1, 1);
    - cplex.addLe(cs1, 3);
    - cplex.addEq(cs1, 0);

- Useful methods:
  - cplex.prod(a,b);
  - cplex.addMinimize(obj);
  - cplex.solve();
  - cplex.getValue(x[1]);
  - cplex.getObjValue();
  - cplex.getBestObjValue();