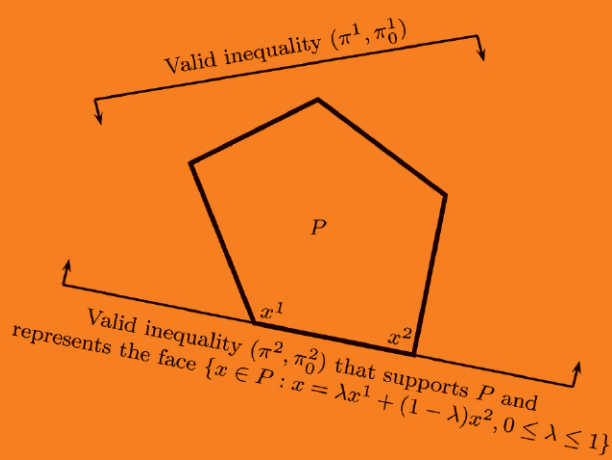


## International Postgraduate Program MSc in Computer Science **Optimization in Operations Research** <http://oro.univ-nantes.fr>



### ● Eight Specialized Areas

- Graphs and Mathematical Programming
- Computational Intelligence
- Constraint Programming
- Nonlinear Programming
- Multi-Objective Optimization
- Multicriteria Decision Aid
- Supply-Chain Optimization
- Computational Bioinformatics

### ● Some application domains

Computing (big data, data mining, cloud computing) – Design (mechanical, VLSI) – Logistics (port, airport, humanitarian, distribution) – Management (traffic, projet, team, energy, sport) – Transportation (urban, air, maritime, road, space) – Production (planning, timetabling, inventory control, scheduling) – Telecom – Network – Health – Bioinformatics – Robotics – Finance – Agri-food – Cutting – Loading – Games



$$\begin{aligned} \text{"min" } z_k(X) &= \sum_{i=1}^n \sum_{j=1}^n c_{ij}^k x_{ij} & k = 1, \dots, p \\ \text{subject to} & \sum_{j=1}^n x_{ij} = 1 & i = 1, \dots, n \\ & \sum_{i=1}^n x_{ij} = 1 & j = 1, \dots, n \\ & x_{ij} \in \{0, 1\} & i, j = 1, \dots, n \end{aligned}$$

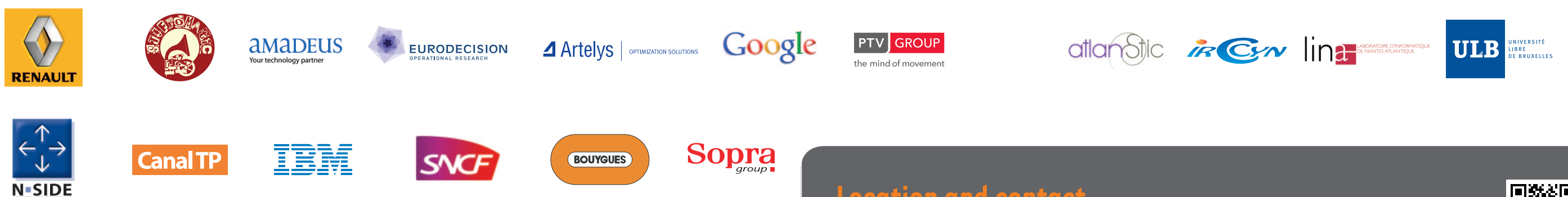
```

Procedure DepositPheromone(k)
Input: k /* ant identifier
Delta tau <- 1/ant[k].tour.Length;
for i <- 1 to n do
    j <- ant[k].tour[i];
    l <- ant[k].tour[i+1];
    pheromone[j][l] <- pheromone[j][l] + Delta tau;
    pheromone[l][j] <- pheromone[l][j];
    
```



### ● Application Deadlines

Early Applications: April 1<sup>st</sup>  
Late Applications: Mid of June  
Applications are processed periodically  
Early applications are encouraged  
More about the program and applications on our website



#### Location and contact

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