

COMP9334 Solution to Tutorial for Week 11

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1. (a) The decision variables are

- $x_{ij1} = 1$ if the primary path uses link (i, j) , otherwise 0
- $x_{ij2} = 1$ if the backup path uses link (i, j) , otherwise 0

The object is to minimise

$$\sum_{(i,j) \in E} c_{ij}(x_{ij1} + x_{ij2}) \tag{1}$$

subject to

$$\begin{aligned} \sum_{j:(i,j) \in E} x_{ijk} - \sum_{j:(j,i) \in E} x_{jik} &= \begin{cases} 1 & \text{if } i = n_1 \\ 0 & \text{if } i \in N - \{n_1, n_2\} \\ -1 & \text{if } i = n_2 \end{cases} & k = 1, 2 \\ \sum_{(i,j) \in E} d_{ij}x_{ij1} &\leq d_{\max} \\ \sum_{(i,j) \in E} d_{ij}x_{ij2} &\leq d_{\max} \\ (x_{ij1} + x_{ij2})b &\leq r_{ij} \\ x_{ij1} + x_{ij2} &\leq 1 \\ x_{ijk} &\in \{0, 1\} \text{ for all } (i, j) \in E, k = 1, 2 \end{aligned}$$

(b) The paths are 1–6–5–4 and 1–2–6–3–4. AMPL files are in `disjoint_hw.dat`, `disjoint_hw.mod` and `disjoint_hw_batch`