

$$\frac{d^2 u_1}{dt^2} + \Gamma_{11}^1 \left(\frac{du_1}{dt}\right)^2 + \Gamma_{12}^1 \frac{du_1}{dt} \frac{du_2}{dt} + \Gamma_{22}^1 \left(\frac{du_2}{dt}\right)^2 = 0$$

$$\frac{d^2 u_2}{dt^2} + \Gamma_{11}^2 \left(\frac{du_1}{dt}\right)^2 + \Gamma_{12}^2 \frac{du_1}{dt} \frac{du_2}{dt} + \Gamma_{22}^2 \left(\frac{du_2}{dt}\right)^2 = 0$$

$s = t$ par. of breaks
 $u_1 = s, u_2 = c \in \mathbb{R}$

geodesicity

$$\Rightarrow \frac{du_2}{ds} = \frac{d^2 u_2}{ds^2} = 0$$

$$\frac{du_1}{ds} = 1, \quad \frac{d^2 u_1}{ds^2} = 0$$

$$\Rightarrow \Gamma_{11}^1 = 0$$

$$\Gamma_{11}^2 = 0$$

$$f_{11} = \Gamma_{11}^1 f_1 + \Gamma_{11}^2 f_2 + h_{11} u$$