Computer Vision I (CSCI 3240U) **In-class Exercise**

Please hand in this paper to the instructor before the end of the lecture.

Lastname (PRINT):	_____	Firstname:	_____
Student number:	_____	Date:	_____

Q. State the *brightness constancy* assumption, and write down the equation it gives after a first-order Taylor expansion. That equation has two unknowns and one constraint — name the resulting problem.

Q. Lucas-Kanade assumes constant flow over a window, giving $M\,[u \;\; v]^\top = -[\sum I_x I_t \quad \sum I_y I_t]^\top$ with $M = \sum_W \begin{bmatrix} I_x^2 & I_x I_y \\ I_x I_y & I_y^2 \end{bmatrix}$. You have met M in Lecture 1 this week. Where exactly, and what was it used for?

Q. For each window, state what you expect of the eigenvalues of M and whether the flow is recoverable.

Window contents	λ_1	λ_2	Flow recoverable?
A corner			
A long straight edge			
A textureless patch			

Q. A vehicle near the camera moves 70 pixels between frames, and your window is 21×21. Explain why the estimate will be wrong, and how a Gaussian pyramid fixes it.