Università della Svizzera italiana

Faculty of Informatics

# Computer Vision & Pattern Recognition

## Spring 2025

## Assignment 6

April 17, 2025

### Problem 1 [5 points]

Show that the conic represented by a non-singular, symmetric matrix

$$C = \begin{pmatrix} a & b/2 & d/2 \\ b/2 & c & e/2 \\ d/2 & e/2 & f \end{pmatrix}$$

with $\delta = b^2 - 4ac < 0$ and $(a + c) \det C > 0$ is imaginary, that is, the set

$$\{(x, y)^T \in \mathbb{R}^2 : ax^2 + bxy + cy^2 + dx + ey + f = 0\}$$

is empty.

### Problem 2 [5 points]

Write a program that rectifies the $300 \times 400$ (height $\times$ width) pixel image $A$ "homework6.pgm" and generates a $300 \times 370$ output image $B$ by applying the projective transformation $h$ that maps the pixels

$$p_1 = (244, 263), \qquad p_2 = (238, 353), \qquad p_3 = (199, 350), \qquad p_4 = (201, 262)$$

in $A$ to the pixels

$$q_1 = (232, 216), \qquad q_2 = (232, 311), \qquad q_3 = (197, 311), \qquad q_4 = (197, 216)$$

in $B$. Use the inverse of $h$ and bilinear interpolation in $A$ for computing the intensities of the pixels in $B$.

Hand in your code and the result image $B$.

---

**Solutions must be returned on May 6, 2025 via iCorsi**