## Computer Architectures.

## Laboratory projects

Write a parallel application that:

- 1. sums up the elements of the list. (OpenMP: 1p., MPI 1p.)
- 2. returns two different values, one summarising the values on odd indexes, one summarizing the values on even indexes. (OpenMP: 1p., MPI 2p.)
- 3. counts the number of odd and even values in the list, return both results. (OpenMP: 1p., MPI 2p.)
- 4. multiplies all elements of a large array by by a value prompted from the user (OpenMP: 1p., MPI 2p.)
- 5. adds two very large arrays (a,b) to find c=a+b (OpenMP: 1p., MPI 2p.)
- 6. smoothies a 2D image with a top-hat operation. (OpenMP: 2p., MPI 3p.)
- 7. Given a set of particles (with mass and position)
  - (a) compute the position of the centre of mass (OpenMP: 2p., MPI 3p.)
  - (b) shift set of particles to the centre of mass system (OpenMP: 2p., MPI 3p.)
  - (c) find all particles at a given distance from a given location (OpenMP: 2p., MPI 3p.)
- 8. calculates a value of  $\pi$  using monte carlo method (OpenMP: 1p., MPI 2p.)
- 9. smoothies a 2D image with a median operation (OpenMP: 2p., MPI 3p.)
- 10. calculates a histogram of an image (OpenMP: 2p., MPI 3p.)
- 11. detects edges in image using convolution (OpenMP: 2p., MPI 3p.)
- 12. calculates factorial n! for large values of n (OpenMP: 2p., MPI 3p.)
- 13. Integrates a given function (OpenMP: 2p., MPI 3p.)
- 14. performs an image binarization (OpenMP: 2p., MPI 3p.)
- 15. Perform a sort operation (OpenMP: 2p., MPI 3p.)