

PH.D. IN MATHEMATICS AND COMPUTER SCIENCE

# COURSE SCHEDULE

ACADEMIC YEAR 2022/2023

## INVERSE DISTANCE WEIGHTING PARTITION OF UNITY METHODS: THEORY, IMPLEMENTATION AND APPLICATIONS

LECTURERS: FRANCESCO DELL'ACCIO, FILOMENA DI TOMMASO  
UNIVERSITY OF CALABRIA

26 - 29 JUNE

THE GOAL OF THE COURSE IS TO GIVE AN INTRODUCTION ON THE INVERSE DISTANCE WEIGHTING-PARTITION OF UNITY METHODS FOR SCATTERED DATA INTERPOLATION AND ON THEIR APPLICATIONS TO THE NUMERICAL SOLUTIONS OF PDES BY COLLOCATION. THESE METHODS ARE BASED ON THE LITTLE'S OBSERVATION ABOUT THE POSSIBILITY TO IMPROVE THE PRECISION AND THE BEHAVIOR OF THE CLASSICAL SHEPARD INTERPOLANTS ONLY BY FIXING TRIANGULATIONS OF THE SCATTERED NODES AND BY BLENDING LOCAL LINEAR INTERPOLANTS ON THE VERTICES OF TRIANGLES WITH SHEPARD LIKE BASIS FUNCTIONS BASED ON THOSE TRIANGLES. THE MAIN ADVANTAGE OF THE LITTLE INTERPOLANTS IS THEIR EXPLICIT EXPRESSIONS THAT DO NOT MAKE USE OF ANY DERIVATIVE DATA (EXACT OR APPROXIMATED). MOREOVER IT IS POSSIBLE TO PROVIDE ALGORITHMS FOR THEIR FAST COMPUTATION BASED ON A CRITERION OF CHOICE OF TRIANGLES (WHICH MAY OVERLAP OR BEING DISJOINT) AND ON A SEARCHING TECHNIQUE TO DETECT AND SELECT THE NEAREST POINTS. FURTHER IMPROVEMENTS OF SUCH INTERPOLANTS REQUIRE THE SOLUTION OF TWO MAIN PROBLEMS: THE PARTITIONING OF THE NODE SET IN ORDERED SUBSETS THAT GUARANTEES THE EXISTENCE AND ACCURACY OF APPROXIMATION OF LOCAL INTERPOLATION POLYNOMIALS OF FIXED TOTAL DEGREE AND THE POSSIBILITY TO COMPUTE THEM IN A STABLE WAY. THERE IS EVIDENCE THAT SUCH INTERPOLANTS ARE USEFUL IN THE NUMERICAL SOLUTION OF ELLIPTIC PDES VIA COLLOCATION, DUE TO THEIR EXPLICIT REPRESENTATION IN TERMS OF THE FUNCTION VALUES WHICH REFLECTS IN A LOW CONDITION NUMBER OF THE COLLOCATION MATRIX.

### CLASS SCHEDULE:

MON 26/06 9:30-12:30  
TUE 27/06 9:30-12:30  
WED 28/06 9:30-12:30  
THU 29/06 9:30-12:30

CLASSROOM "AULA A"