UNIVERSITÀ DEGLI STUDI DI MILANO

CONCORSO PUBBLICO, PER ESAMI, A N. 1 POSTO DI CATEGORIA D - AREA TECNICA, TECNICO-SCIENTIFICA ED ELABORAZIONE DATI, CON RAPPORTO DI LAVORO SUBORDINATO A TEMPO INDETERMINATO PRESSO L'UNIVERSITÀ DEGLI STUDI DI MILANO - DIPARTIMENTO DI SCIENZE E POLITICHE AMBIENTALI - PROGETTO DIPARTIMENTI DI ECCELLENZA 2023/2027 - CODICE 22379

La Commissione giudicatrice della selezione, nominata con Determina Direttoriale n. 20920 del 19/12/2023, composta da:

Prof.ssa Paola Causin	Presidente
Prof. Federico Zambelli	Componente
Dott. Uliano Guerrini	Componente
Sig.ra Serenella Ricci	Segretaria

comunica i quesiti relativi alla prova orale:

TRACCIA NR. 1

Quesito 1
Il candidato descriva il concetto di overfitting di un modello statistico ed illustri le strategie che conosce per prevenirlo/limitarlo.

Quesito 2
Il candidato illustri, anche con esempi, la differenza tra un generico problema parallelo ed un problema "embarrassingly parallel" evidenziando quali sono i problemi hardware e software che si incontrano all'aumentare della dimensionalità del problema

brano da tradurre
''Epidemic modelling'' describes a set of approaches where mathematical, statistical, and computational tools are used to study the spread of communicable pathogens in host populations. It uses data and hypotheses describing the demographic processes, environmental characteristics, transmission opportunities, and health consequences of diseases. Equipped with suitable equations for evolution, it can be used for logical verification with conceptual ''what if. . .'' experiments, quantification, and conjecture based on the construction of forecasts and scenarios. As in other scientific domains, these models aim at providing a simplified representation of a real phenomenon, focusing on the subset of properties and processes considered as essential drivers. The construction of these models is therefore the result of structural choices motivated by previous knowledge, data and observation and a set of assumptions based on our understanding of the phenomenon under study.

TRACCIA NR. 2

Quesito 1
Il candidato illustri un metodo per la ricerca dei minimi locali di una funzione di più variabili.
Quesito 2
Il candidato illustri le principali librerie open source di sua conoscenza che permettono l'implementazione di reti neurali
brano da tradurre
There are various reasons to model epidemics. First of all, measuring the

effect of interventions by direct observation is seldom possible. Contrary to drugs that can be evaluated at the patient level and compared between groups of patients, interventions in epidemics can only be assessed at the population level. Setting aside the difficulty of measuring incidence at the population level, this implies that repeated observation of the same population under different regimes is not possible. In this context, modelling is the only way to compare potential scenarios for evolution. A second difficulty is the non-linear nature of epidemic dynamics and the importance of their stochastic components (beginning and end of a wave, super-spreading): the trajectory of an epidemic cannot be predicted by simple proportionality rules and more sophisticated computations, as performed in models, are required. A third challenge is that unbiased descriptors of an epidemic would require complete knowledge of the whole population at all times, when observation is at best partial.

TRACCIA NR. 3

Quesito 1
Il candidato illustri un metodo per la ricerca degli zeri di una funzione di una variabile
Quesito 2
Il candidato illustri le principali differenze tra le librerie di calcolo OPENMP ed OPENMPI con particolare riguardo all'efficienza ed alla scalabilità di un problema parallelo.
brano da tradurre
Modelling in infectious disease epidemiology today relies on a variety of methods based on decades of developments at the interface of demography, medicine, and biology. The vast majority of models adopt a ''compartmental'' description of the disease as a sequence of different stages encountered upon infection to cure or death. The paradigmatic example is the ''S-I-R'' model, describing individuals as first susceptible to infection (S), then infected with the disease and contagious (I), and finally removed from transmission by recovery or deaths (R). In such models, the incidence is described as both proportional to the number of susceptible individuals and the number of infected individuals, leading to the non-linear equation for evolution.

Milano, 25 gennaio 2024

La Commissione

Prof.ssa Paola Causin Presidente

Prof. Federico Zambelli Componente

Dott. Uliano Guerrini Componente

Sig.ra Serenella Ricci Segretaria