IS THE QUESTION IMPORTANT?
HAS THE QUESTION BEEN WELL FORMULATED?
DO DATA EXIST THAT PERMIT A SOLUTION TO THE PROBLEM?

IF NOT

CAN THE DATA BE OBTAINED AS PROPOSED?
ARE THERE CLASSICAL ETHICAL CONSIDERATIONS THAT NEED TO BE ADDRESSED?
ARE THE HYPOTHESES CREDIBLE AND REFUTABLE?
WHAT ARE THE EXPERIMENTAL METHODS PROPOSED – ARE THEY FEASIBLE?

ARE THEY ABLE TO PROVIDE AN ANSWER TO THE QUESTION POSED?
TECHNIQUES THAT CONSTITUTE NEW TOOLS FOR DOING BETTER MEDICINE

MULTIVARIATE ANALYSIS

MACHINE LEARNING & CLASSIFICATION

DEEP LEARNING

LARGE & CHEAP MEMORY

DISTRIBUTED COMPUTING

MASSIVELY PARALLEL COMPUTING

SUPERCOMPUTERS
FUNDAMENTAL ISSUE

CLINICAL AND NEUROSCIENCE DATA MUST BE INTEGRATED

**SIMULATION** is an analytical methodology & depends on high performance computing

**SIMULATION** is always bottom up – it is a reconstruction from real data
- It generates complexity from simpler elements
- It results in a PREDICTIVE MODEL that CONSTRAINS next level organisation

**SIMULATION** can start from any level but always bottom-up and data led
- But data are useless unless they help reconstruction from one level to the next.

WE NEED GOOD PREDICTIVE SIMULATION MODELLING TO REDEFINE & REFINE NEURO-DIAGNOSES IN FUTURE DIAGNOSTIC MANUALS
WHAT STATISTICAL AND ANALYTICAL METHODS ARE PROPOSED?
WHAT IMPACT WILL THE RESULTS HAVE ON SOCIETY AND INDIVIDUALS IN THE FUTURE?
THE ETHICAL ASPECTS OF A PROJECT OR EXPERIMENT ARE AN INTEGRAL COMPONENT OF ITS CONCEPTUALISATION, SPECIFICATION AND FORMULATION

IN NO CASE IS THE ETHICAL PROCESS AN IMPEDIMENT OR A NUISANCE TO SCIENCE; IT CONSTITUTES THE VERTEBRAL COLUMN OF SCIENTIFIC EXPERIMENTATION
REAL ETHICAL QUESTIONS

IN MEDICINE IS IT ETHICAL TO...

✓ TO UNDERUSE INFORMATION (hospital databases)
✓ TO MISUSE COMMUNITY RESOURCES (taxpayers money)
✓ TO RETARD ACQUISITION OF KNOWLEDGE BY RESEARCH

✓ FAIL TO BALANCE RISKS (car driving vs taking treatment)
✓ FAIL TO BALANCE RIGHTS (health and privacy)
✓ FAIL TO BALANCE SAFETY AGAINST EFFICACY (individual risk from treatment)

✓ USE INADEQUATE METHODS IN RESEARCH (linear vs complex analytics)
✓ DO UNDERPOWERED RESEARCH (statistics)
✓ FAIL TO COMMUNICATE RESULTS ACCURATELY (sensationalism vs education)