The Reference Model Uses Modular Population Generation!
Object Oriented Population Generation on the Fly with MIST

MIST Runs Over the Cloud!

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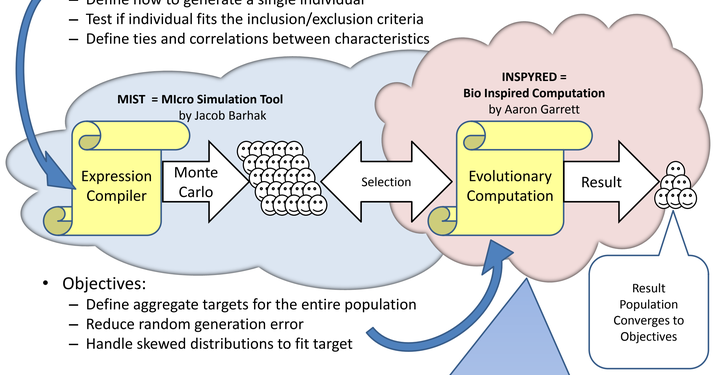
IMAG Multiscale Modeling (MSM) Consortium Meeting
8-10 September 2015

In a Nutshell: A League of Disease Models using the Micro Simulation Tool = MIST
MIST Supports Modular Object Oriented Population Generation

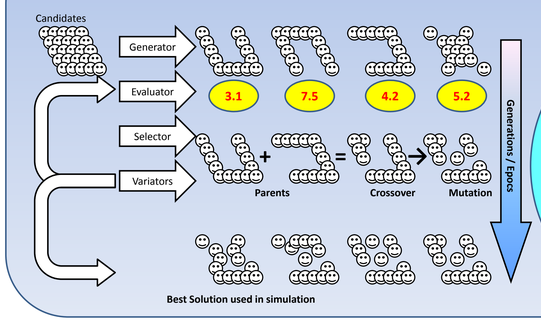
MIST Population Generation Approach

- Generation Expressions:
  - Define how to generate a single individual
  - Test if individual fits the inclusion/exclusion criteria
  - Define ties and correlations between characteristics



- Objectives:
  - Define aggregate targets for the entire population
  - Reduce random generation error
  - Handle skewed distributions to fit target

Evolutionary Computation using Inspyred



Free Open Source Software in Python

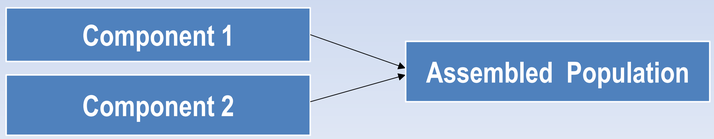
Two Object Oriented Approaches

Initial Easy Step

1) Preassembled Population Based on Overrides

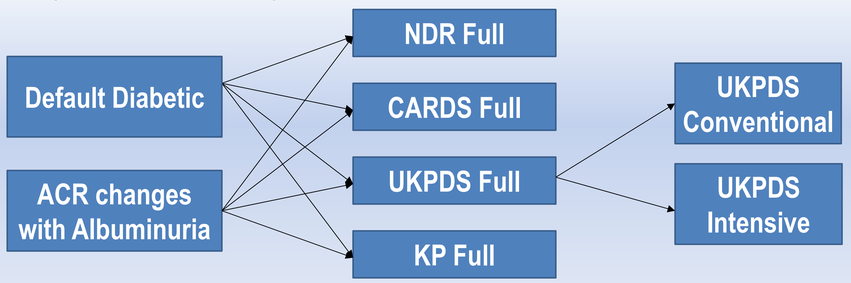
Modular Model

2) "On The Fly" Assembly in Runtime = Dynamically Rearranged



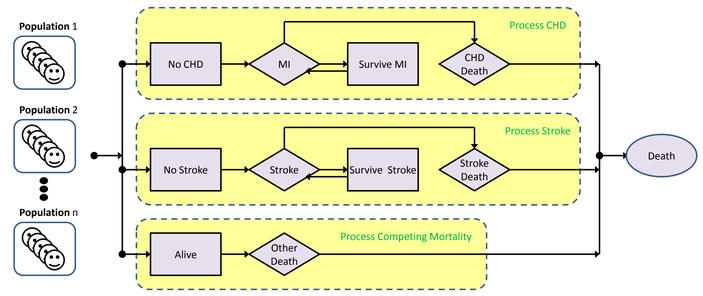
Future flexibility

Object Oriented Implementation



Abstract:

The Reference Model for Disease progression is a league of disease models that determines fitness of publicly available populations and models and assumptions. Population generation is a key component and previous work was presented in this and other venues. The Reference Model has grown to the point that it was hard to maintain the code base and increase the number of populations. Recent advances with the MIcro Simulation Tool (MIST), that runs the model, allow object oriented population generation. This already helped reduce the code base and modeling complexity. Yet even beyond, this technology also supports on the fly assembly of modular population building blocks of code. This powerful technique allows testing our understanding of current published clinical trial summary data. It is possible now to easily introduce variations in population generation to figure out fitness of unknown base assumptions. This is very useful with High Performance Computing (HPC) that allows testing multiple modeling assumptions in parallel. On the fly assembly of building blocks, rather than pre-assembly of overriding population component during inheritance, allows population modeling flexibility not available before.



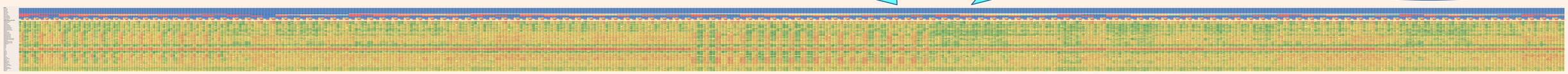
Find the Differences in Approach Results

The Fitness Matrix is like a score board of a league of disease models

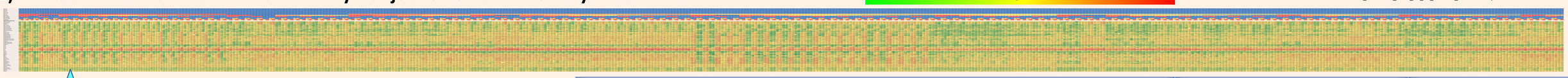
Rows = 47 Cohorts from 9 Populations
Columns = 1088 Models + Assumptions

The Ultimate Potential is:
All Published Clinical Studies

1) Fitness Matrix Results with Preassembled Populations Based on Overrides



2) Fitness Matrix Results with "On The Fly" Object Oriented Assembly in Runtime



Better Fitness to Known Results — Fitness Matrix Legend — Worst Fitness to Known Results

Reproducibility Info:
Version 28: MIST_RefModel_2015_06_12_MATRIX_TraceBack.zip
Version 31: MIST_RefModel_2015_04_17_MATRIX_TraceBack.zip

Similar Picture!

Despite Code Changes

Indicates Model Stability Attributed to Accumulated Knowledge

Successful Code Transition

References:

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[2] J. Barhak, A. Garrett, Population Generation from Statistics Using Genetic Algorithms with MIST + INSPYRED. MODSIM World 2014, April 15 - 17, Hampton Roads Convention Center in Hampton, VA.
Paper: http://sites.google.com/site/jacobbarhak/home/MODSIM2014_MIST_INSPYRED_Paper_Submit_2014_03_10.pdf
Presentation: http://sites.google.com/site/jacobbarhak/home/MODSIM_World_2014_Submit_2014_04_11.pptx

[3] J. Barhak, Object Oriented Population Generation, MODSIM world 2015. 31 Mar – 2 Apr, Virginia Beach Convention Center, Virginia Beach, VA.
Paper: http://modsimworld.org/papers/2015/Object_Oriented_Population_Generation.pdf
Presentation: http://sites.google.com/site/jacobbarhak/home/MODSIM2015_Submit_Jacob_Barhak_2015_03_29.pptx

Acknowledgments:
The IEST GPL modeling framework was initially supported by the Biostatistics and Economic Modeling Core of the MDRTC (P60DK020572) and by the Methods and Measurement Core of the MCDTR (P30DK092926), both funded by the National Institute of Diabetes and Digestive and Kidney Diseases. The modeling framework was initially defined as GPL and was funded by Chronic Disease Modeling for Clinical Research Innovations grant (R21DK075077) from the same institute.
The Reference Model and MIST were developed independently without financial support.

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