Future Computing 2024

The Triumvirate of an Adaptive Criteria Weighting Methodology, Isomorphic Comparator Similarity Measure, and Apropos High Dimensional Data Cluster Validation Index Measures for the Ascertainment of Bespoke Dynamic Fuzzy Lists

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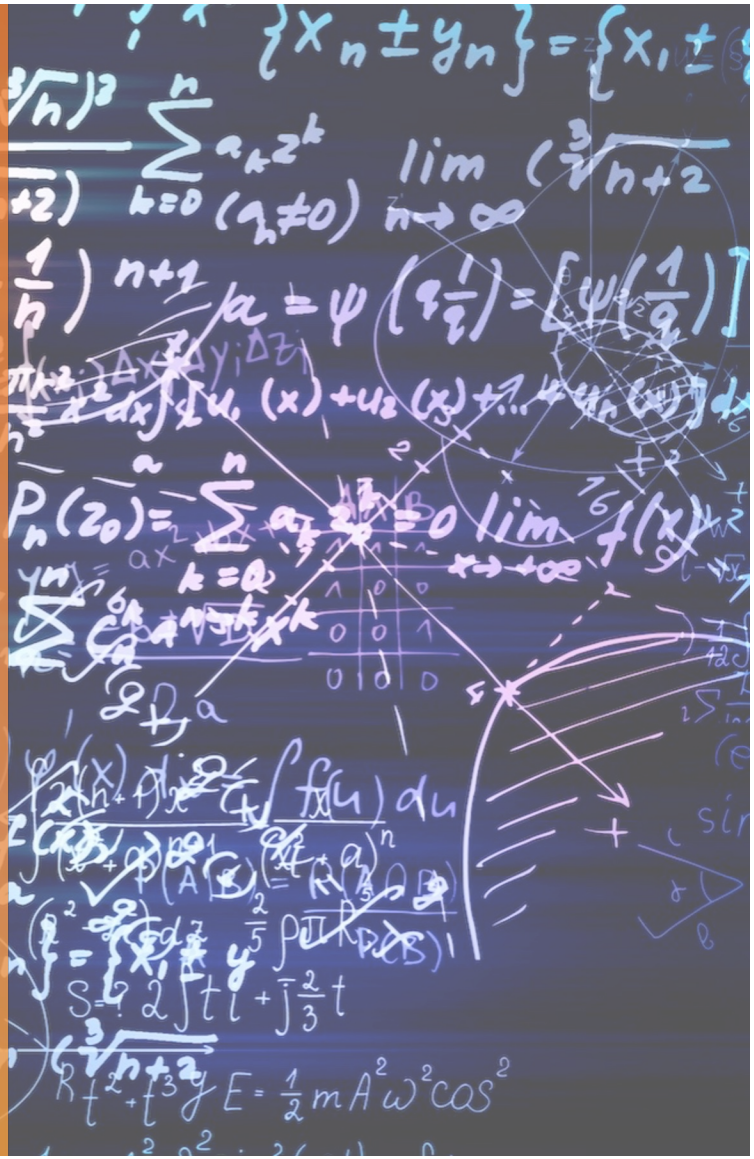

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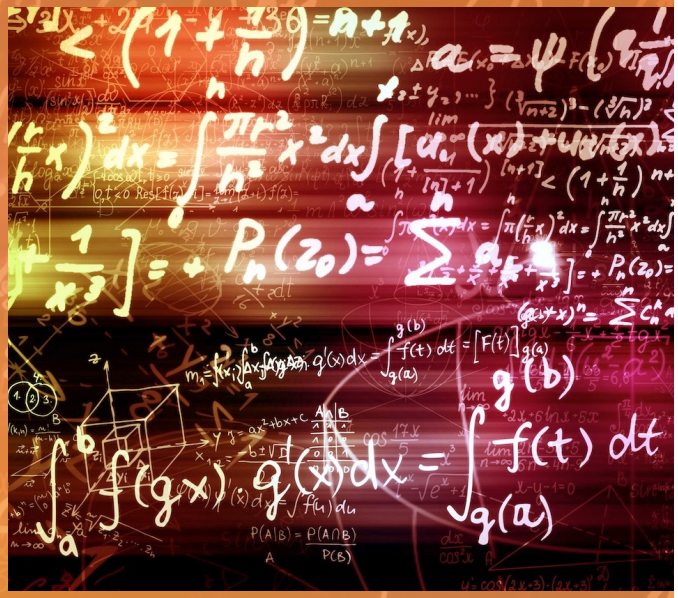

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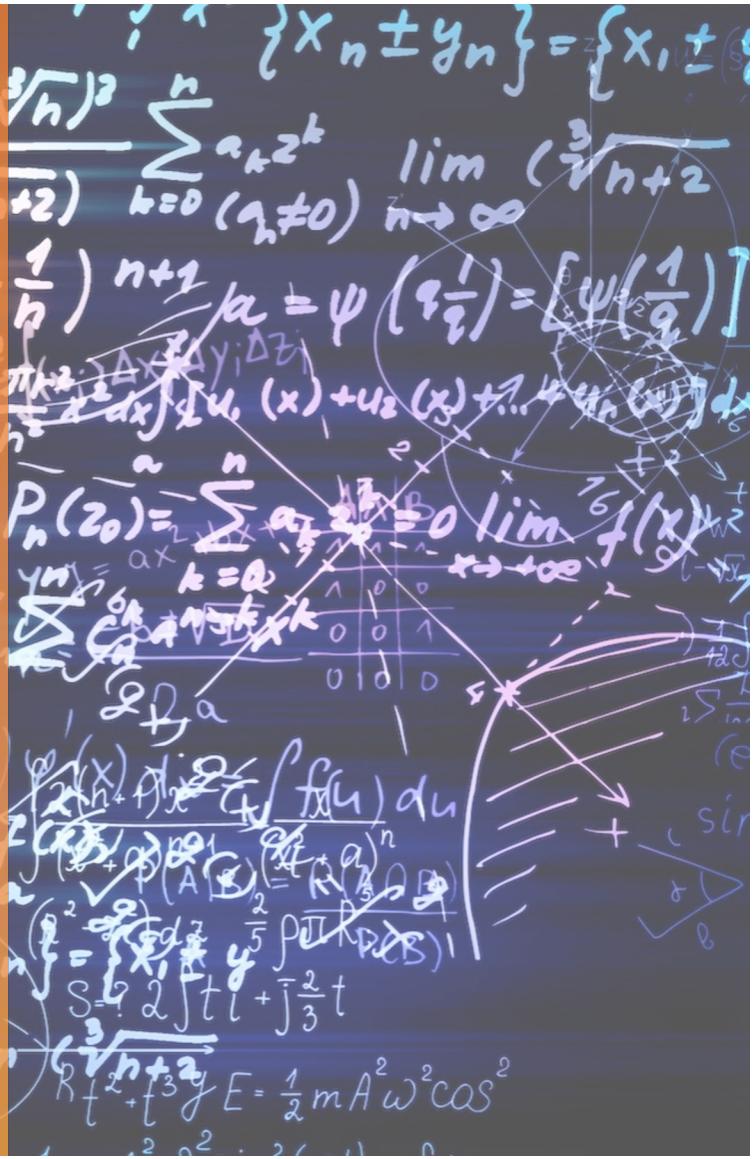
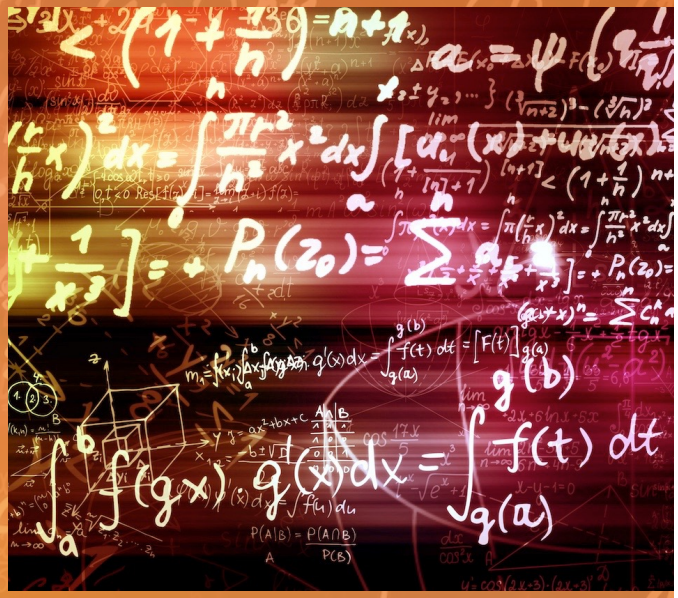


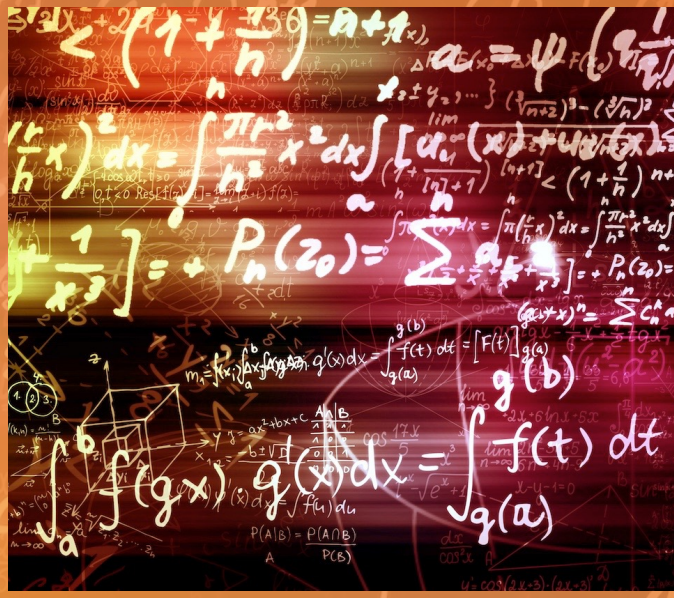
Introduction



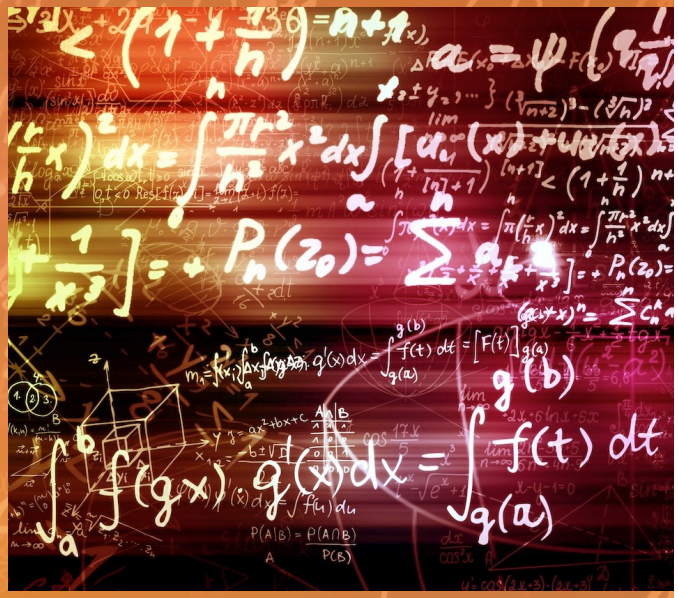
Source:
Allied Arts Guild, Menlo Park

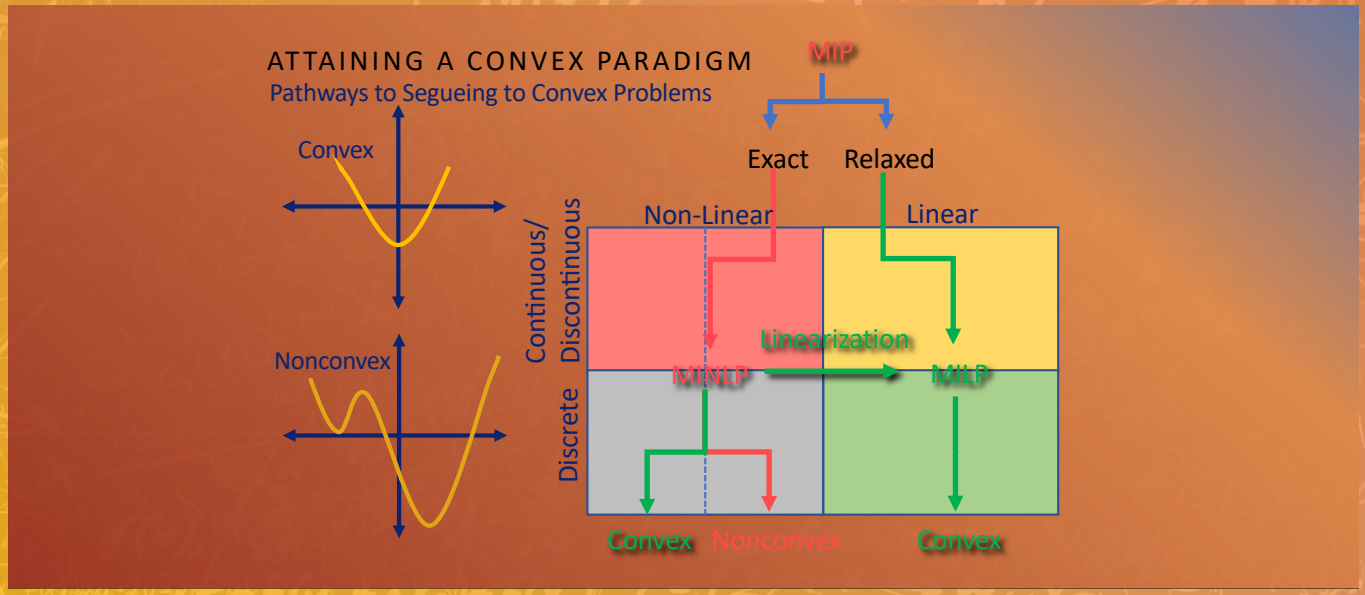
Source:
Stanford University

Background/Refresher

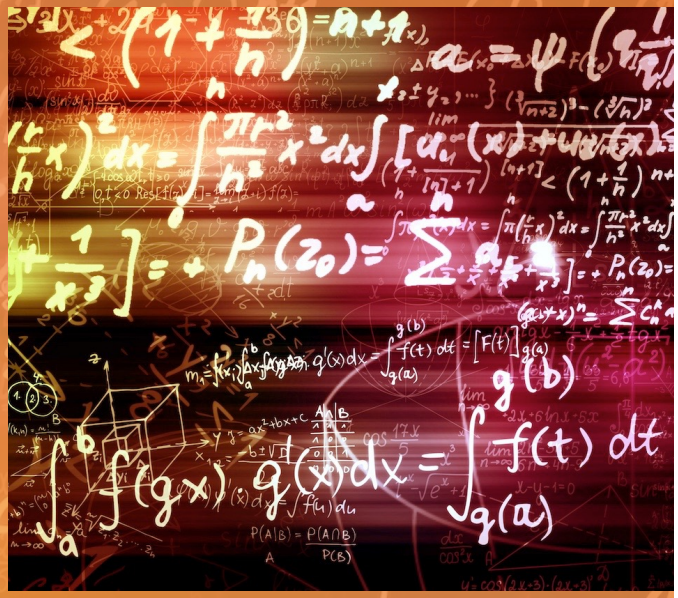


Refresher #1



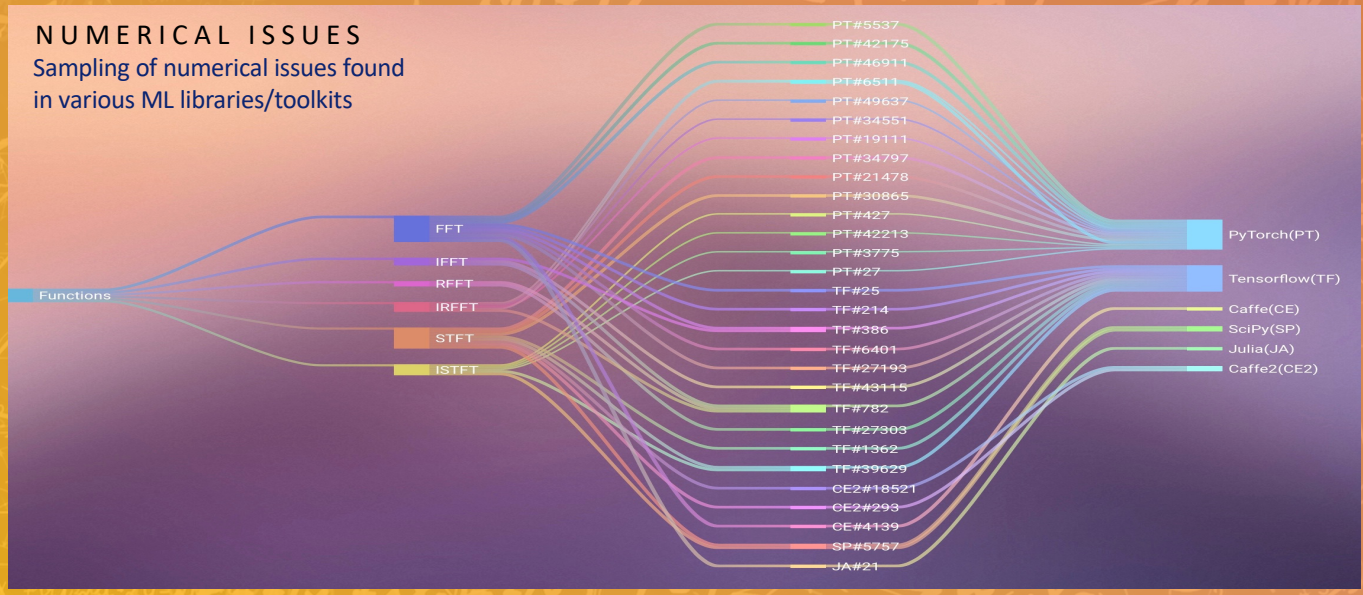

ATTAINING A CONVEX PARADIGM
Pathways to Segueing to Convex Problems
MIP
Exact
Relaxed
Convex
Nonconvex
Non-Linear
Linear
Continuous/
Discontinuous
Discrete
Linearization
MINLP
MILP
Convex
Nonconvex
Convex

Refresher #2

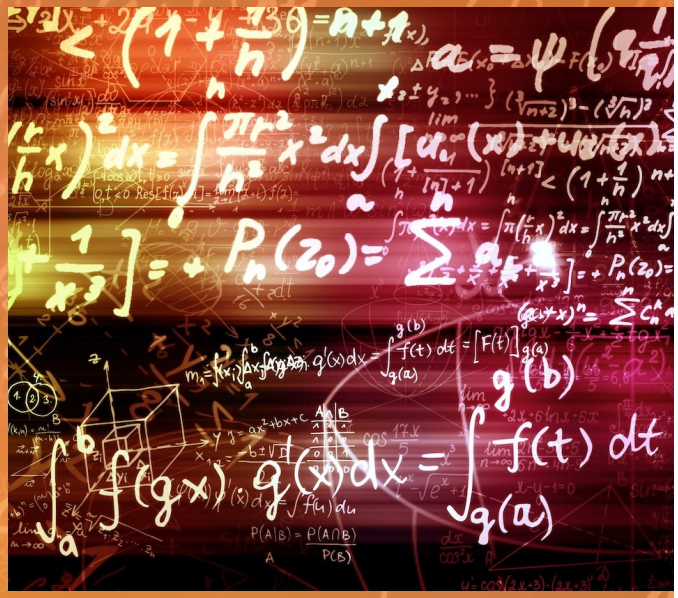


NUMERICAL ISSUES

Sampling of numerical issues found in various ML libraries/toolkits



Refresher #3



Enhanced Numerical Stability Paradigm

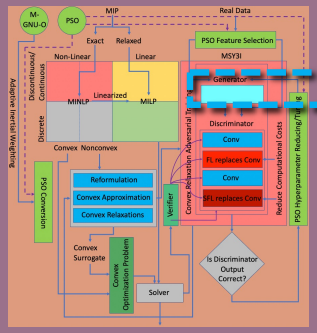
A Specific DCGAN Implementation

Enhanced Numerical Stability Paradigm

RCR Architecture

Key Solver for Convex Optimization Problems

MSY3I #1

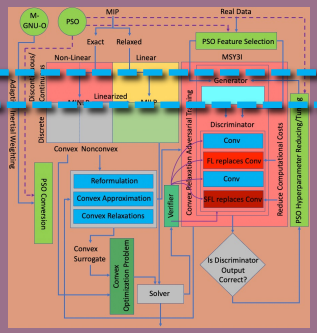


PyTorch v0.4.1

RCR Paradigm #1

Key Solver for the Modified Involved Functions

MSY3I #2



PyTorch v1.7.0

RCR Paradigm #2

Mitigator against Mode Failure/Collapse

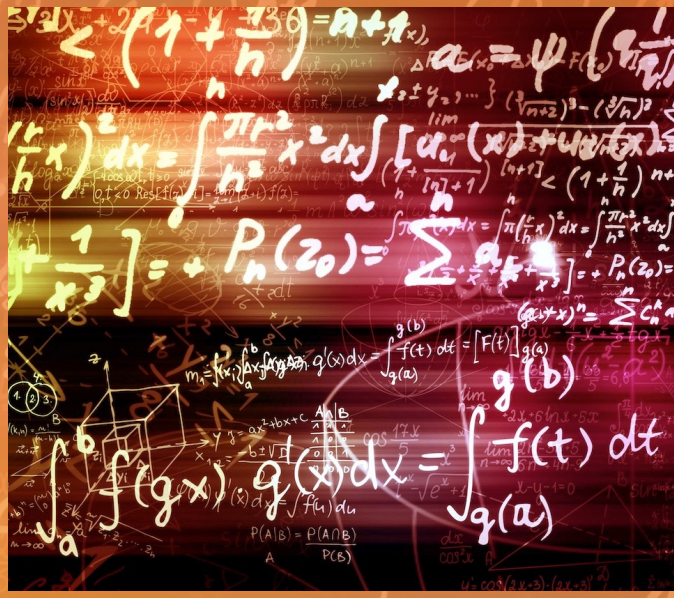
DCGAN #3

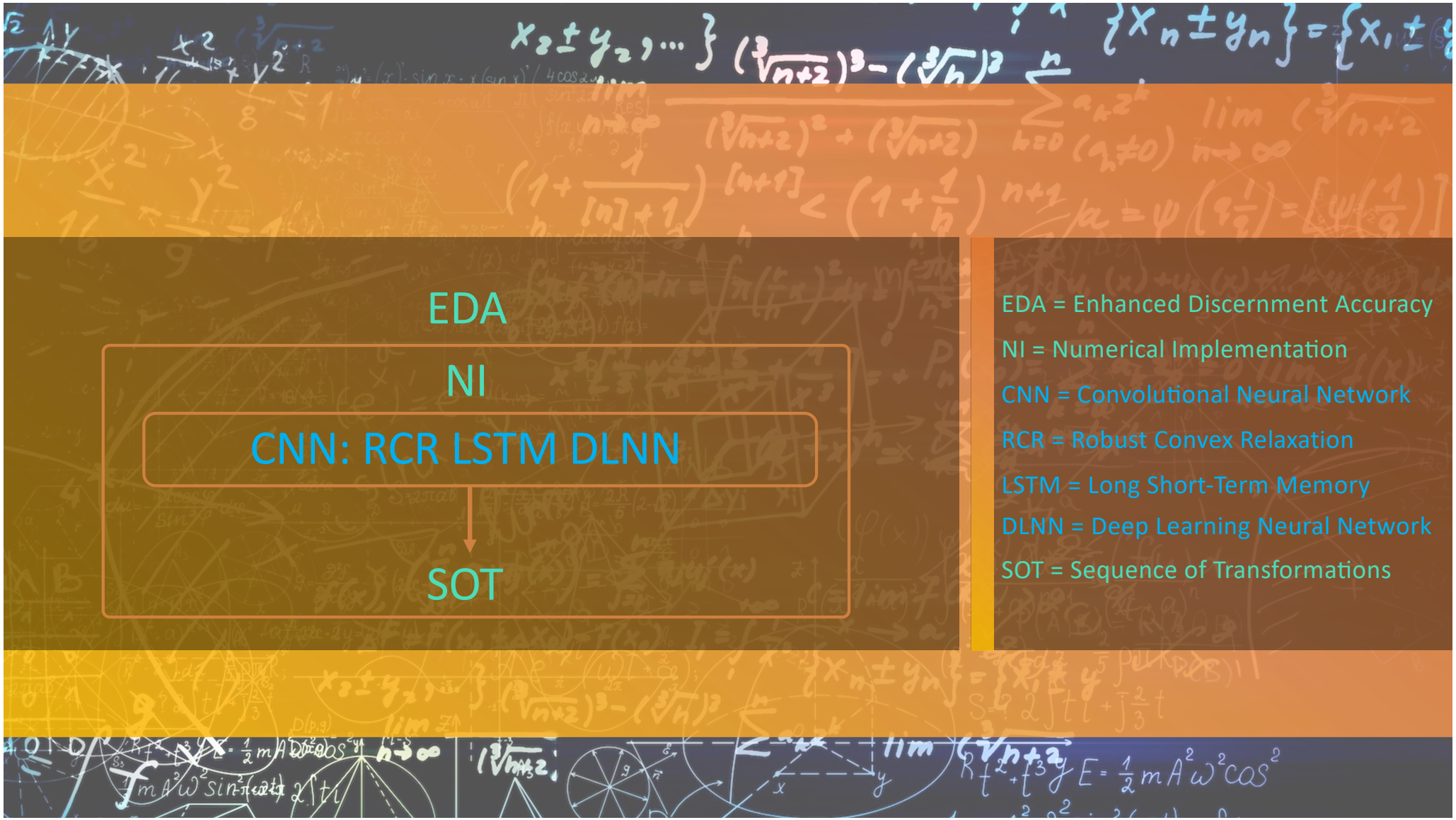
Generator #3

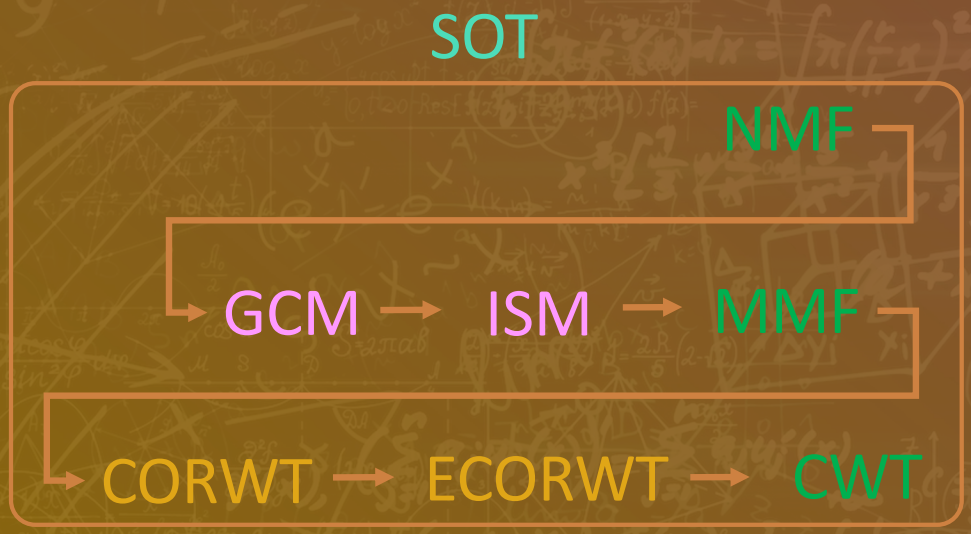
Discriminator #3

TensorFlow v2.0

Refresher #4




EDA
NI
CNN: RCR LSTM DLNN
SOT
EDA = Enhanced Discernment Accuracy
NI = Numerical Implementation
CNN = Convolutional Neural Network
RCR = Robust Convex Relaxation
LSTM = Long Short-Term Memory
DLNN = Deep Learning Neural Network
SOT = Sequence of Transformations



SOT = Sequence of Transformations

NMF = Nonnegative Matrix Factorization

GCM = Gaussian Composite Model

ISM = Input Synthesis Model

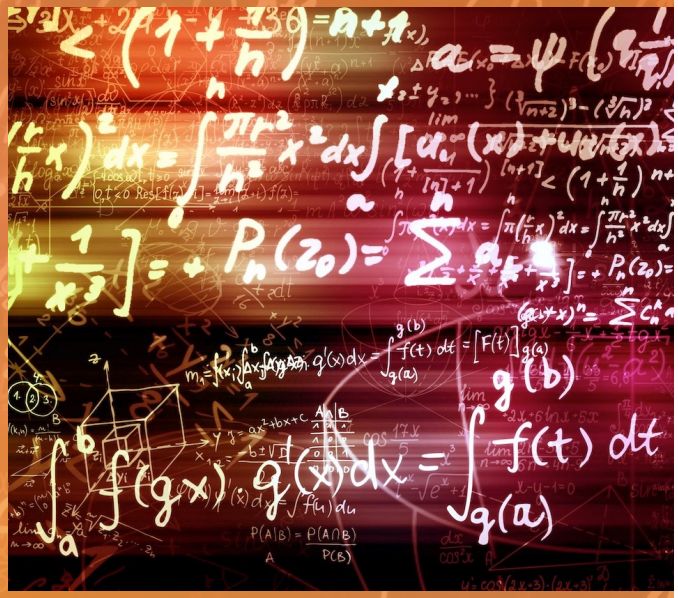
MMF = Multiresolution Matrix Factorization

CORWT = Corresponding Wavelet Transform

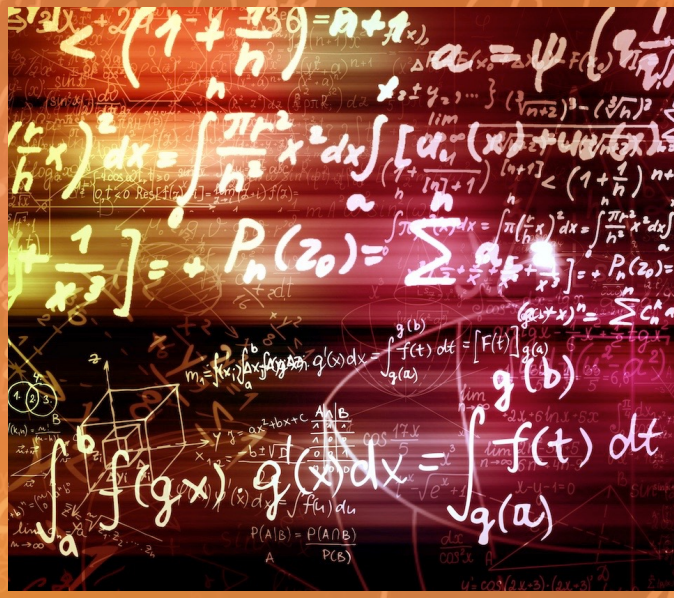
ECORWT = Enhanced CORWT

CWT = Continuous Wavelet Transform

Experimentation



Experimentation – Figure 1



MULTIMOORA:Multi-Objective Optimization on the Basis of Ratio Analysis Method

CPRLD: Constriction Factor (CF)-Particle Swarm Optimization (PSO)-Robust Convex Relaxation (RCR)-Long Short-Term Memory (LSTM)-Deep Convolutional Neural Network (DCNN)

PA: Point Allocation

AHP = Analytical Hierarchy Process

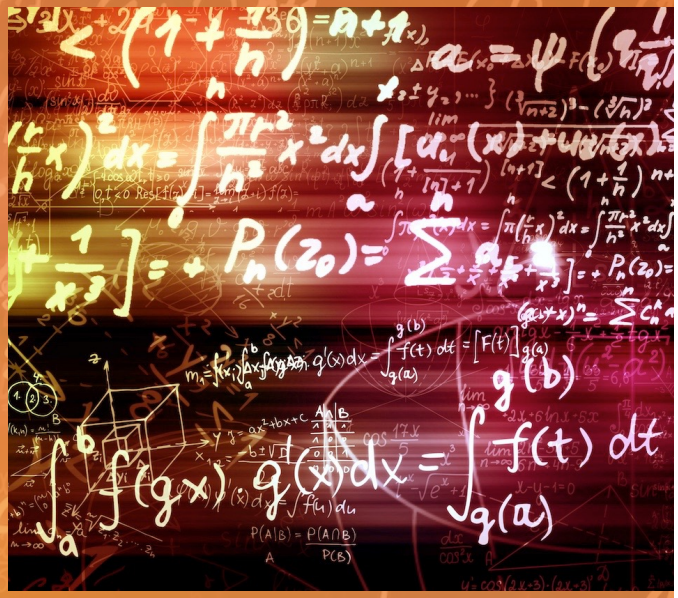
WASPAS = Weighted Aggregated Sum Product Assessment

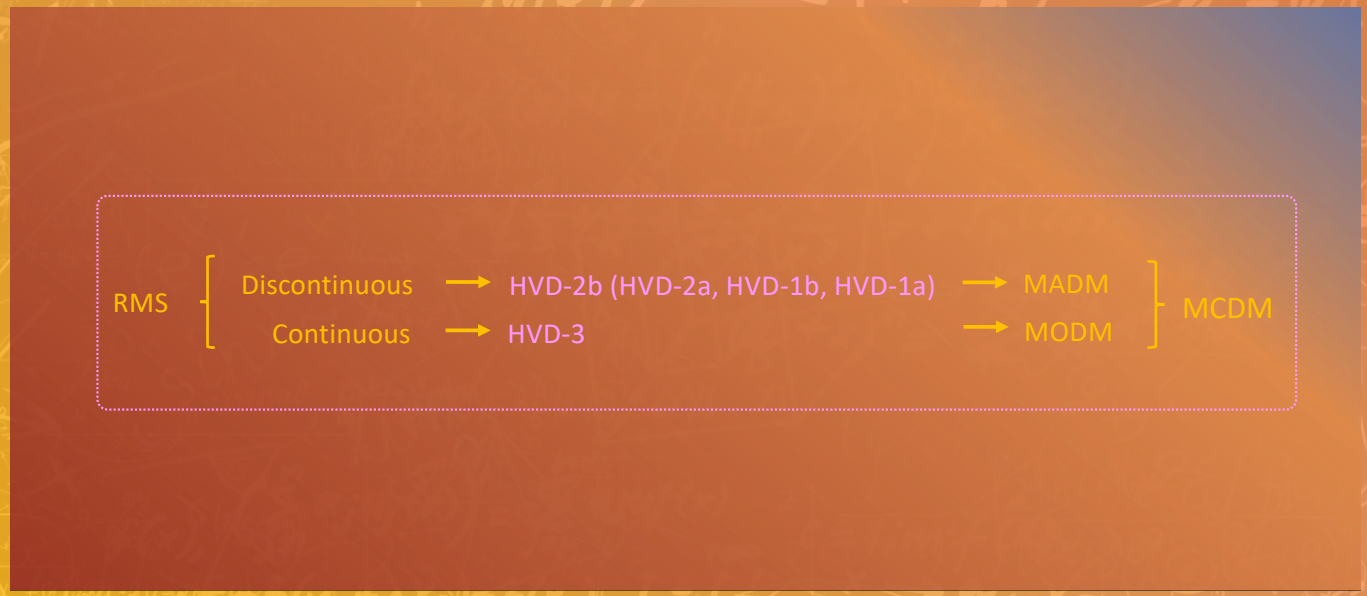
CRITIC: CRiteria Importance through Intercriteria Correlation

TOPSIS: Technique of Order Preference by Similarity to an Ideal Solution

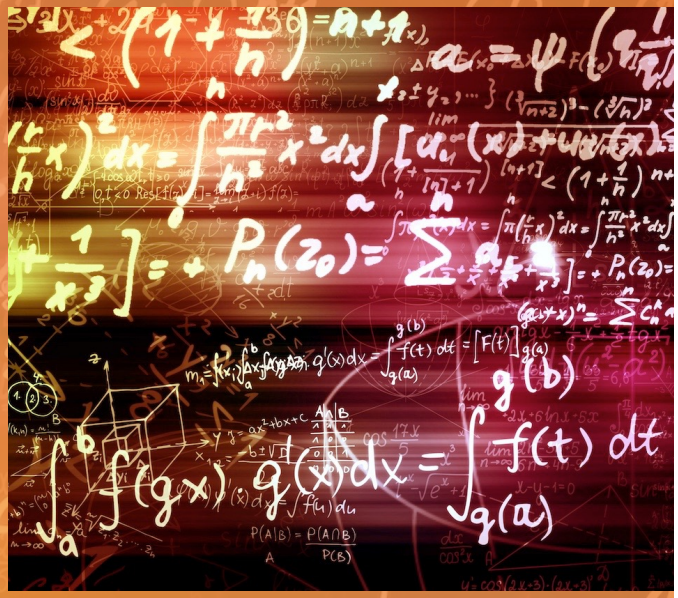
Fuzzy VIKOR: VIšekriterijumsko KOmpromisno Rangiranje

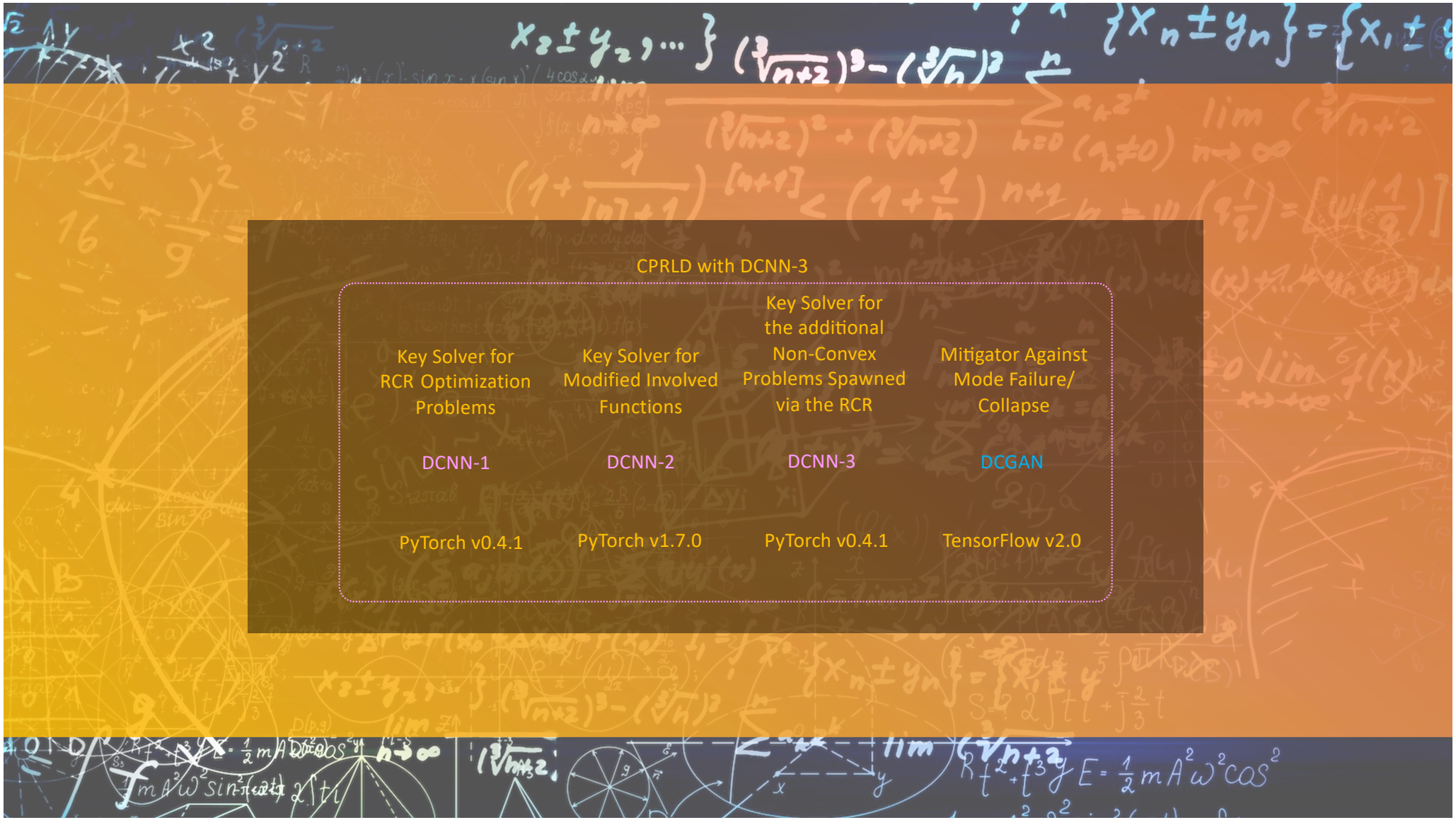
Experimentation – Figure 2




RMS
Discontinuous
HVD-2b (HVD-2a, HVD-1b, HVD-1a)
MADM
Continuous
HVD-3
MODM
MCDM

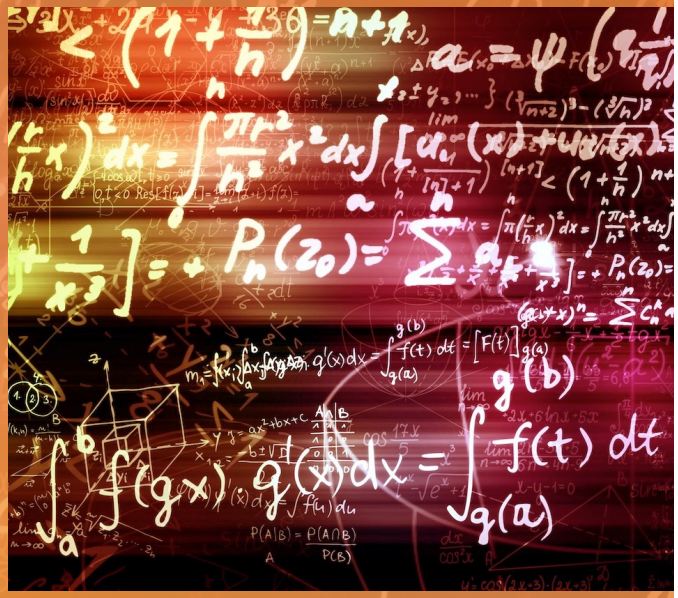
Experimentation – Figure 3

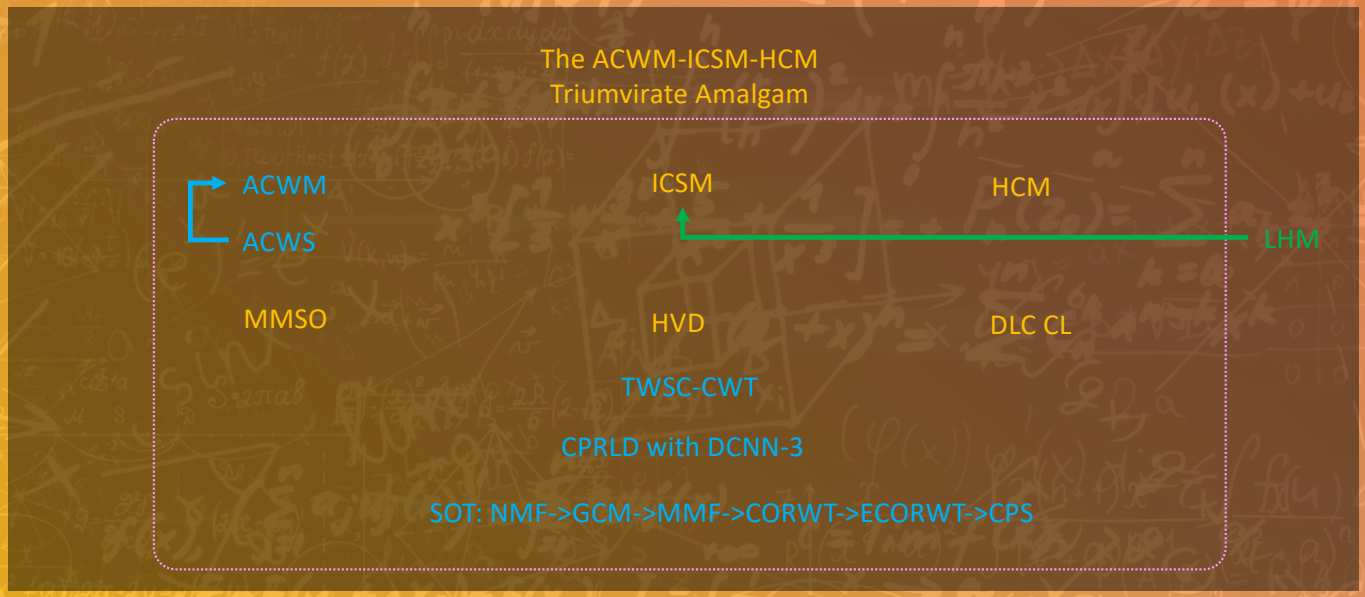



CPRLD with DCNN-3
Key Solver for RCR Optimization Problems
DCNN-1
PyTorch v0.4.1
Key Solver for Modified Involved Functions
DCNN-2
PyTorch v1.7.0
Key Solver for the additional Non-Convex Problems Spawned via the RCR
DCNN-3
PyTorch v0.4.1
Mitigator Against Mode Failure/ Collapse
DCGAN
TensorFlow v2.0


CPRLD with DCNN-4
Key Solver for RCR Optimization Problems
DCNN-1
PyTorch v0.4.1
Key Solver for Modified Involved Functions
DCNN-2
PyTorch v1.7.0
Key Solver for the additional Non-Convex Problems Spawned via the RCR
DCNN-3
PyTorch v0.4.1
Key Solver for AEC Counterpoising
DCNN-4
PyTorch v1.7.0
Mitigator Against Mode Failure/ Collapse
DCGAN
TensorFlow v2.0

Experimentation – Figure 4

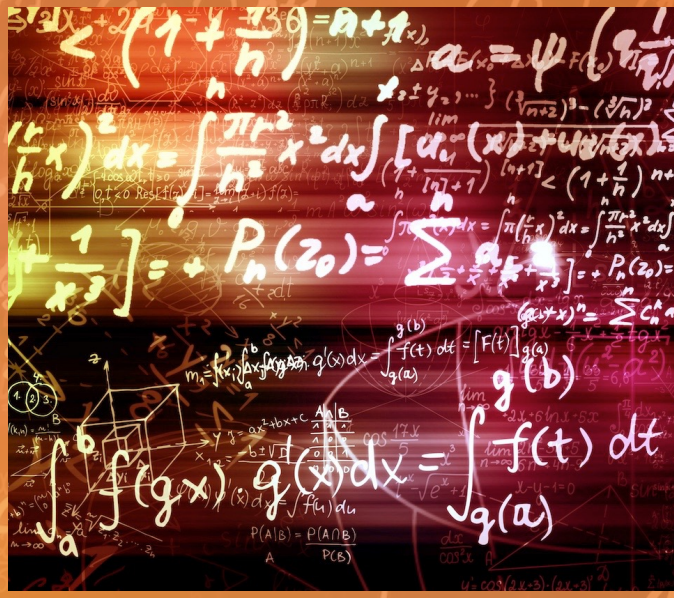



The ACWM-ICSM-HCM
Triumvirate Amalgam
ACWM
ACWS
ICSM
HCM
LHM
MMSO
HVD
DLC CL
TWSC-CWT
CPRLD with DCNN-3
SOT: NMF->GCM->MMF->CORWT->ECORWT->CPS

DLC -> OLC Acceleration

I	II	III	IV	V	VI	VII	VIII	IX
MR	DLC	Min;Elbow	WB	$O(nN^2)$	✓	✓	✓	
BH	DLC	Max_{diff};Elbow	W	O(nN)				
DI	OLC	Max;Max;Max	WB	$O(nN^2)$		✓	✓	
PBM	OLC	Max;Max	WBD	$O(n(k^2+N)$				✓
TW	DLC	Max_{diff};Elbow	W	O(nN)				
PB	OLC	Max;Max	WB	$O(nN^2)$				✓

Reflections



To summarize:

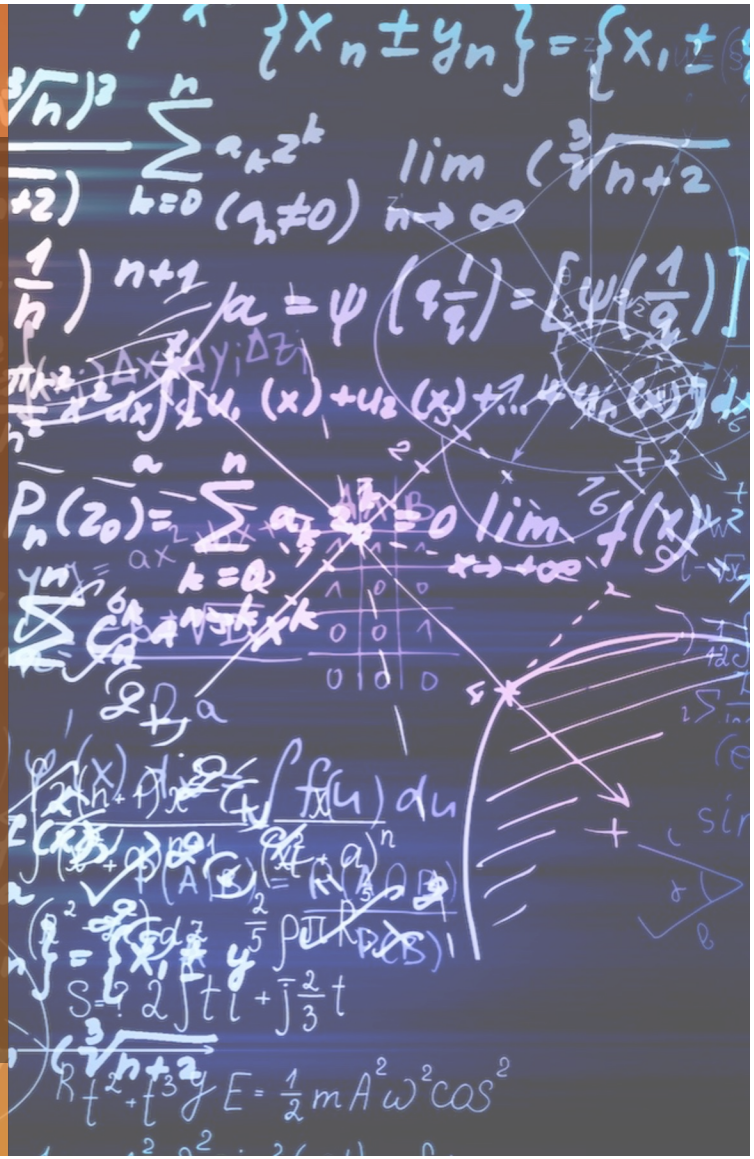
The potential of an enhanced discernment capability, as well as a DLC -> OLC acceleration opportunity, via a bespoke architecture and SOT, seems promising.

In particular, the EDA -> NI -> SOT -> M2ED progression seems robust.

As well, the NI via CNN: RCR LSTM DLNN seems to be a viable implementation.

In turn, the SOT via NMF -> GSM -> ISM -> MMF -> CORWT -> ECORWT -> CWT seems to be viable as well.

Future work will involve more quantitative experimentation in this area.



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Thank You!

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