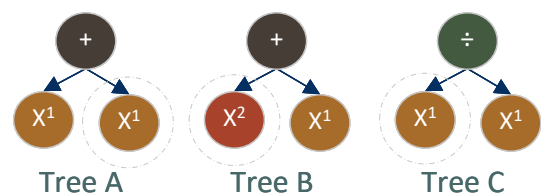Old Solution

Mutation

Replace Subtrees with Randomly Generated Ones

Tree A   Tree B   Tree C

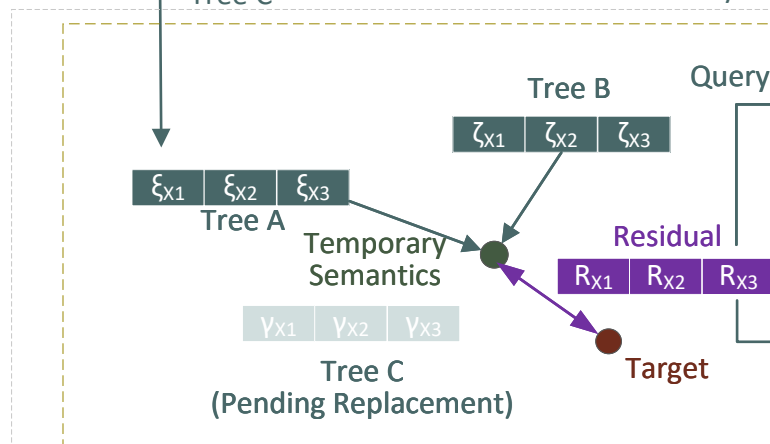Tree A*   Tree B*   Tree C*
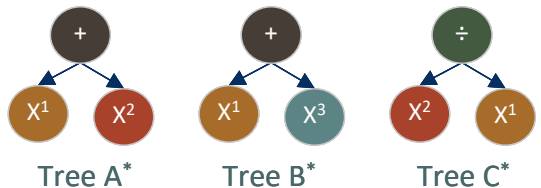
New Solution

Evolutionary Algorithm
(Syntactic/Symbolic Space)

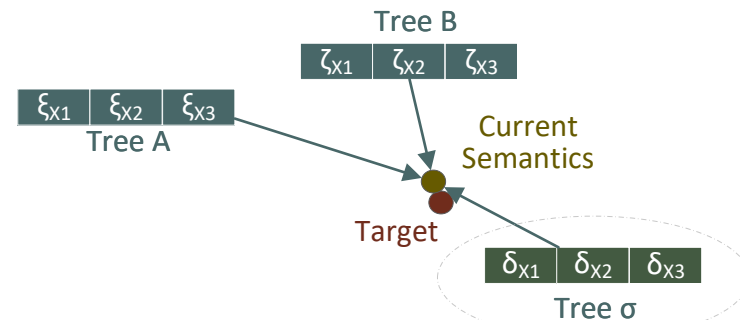Old Solution $(\xi,\zeta,\gamma)=\beta_1\xi+\beta_2\zeta+\beta_3\Gamma$

New Solution $(\xi,\zeta,\delta)=\hat{\beta}_1\xi+\hat{\beta}_2\zeta+\hat{\beta}_3\delta$

Tree B
ζ_{X1} ζ_{X2} ζ_{X3}

Tree A
ξ_{X1} ξ_{X2} ξ_{X3}

Old Semantics

Tree C
γ_{X1} γ_{X2} γ_{X3}

Target
Y_1 Y_2 Y_3

Tree B
ζ_{X1} ζ_{X2} ζ_{X3}

Tree A
ξ_{X1} ξ_{X2} ξ_{X3}

Current Semantics

Target

Tree σ
δ_{X1} δ_{X2} δ_{X3}
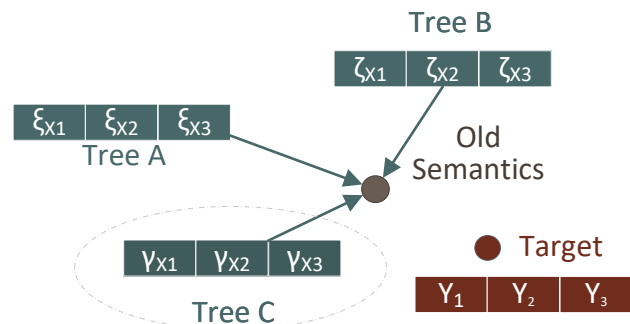
Delete Tree C

Replace a Tree with a New Tree
Generated by a Neural Network

Add Tree σ

Tree B
ζ_{X1} ζ_{X2} ζ_{X3}

Query

Tree A
ξ_{X1} ξ_{X2} ξ_{X3}

Temporary Semantics

Tree C
γ_{X1} γ_{X2} γ_{X3}

Tree C
(Pending Replacement)

Residual
R_{X1} R_{X2} R_{X3}

Target

Prompt

α_{X1} α_{X2} α_{X3}

Tree ô with semantics

Semantic Library

Query

Neural Network

Computing Residual
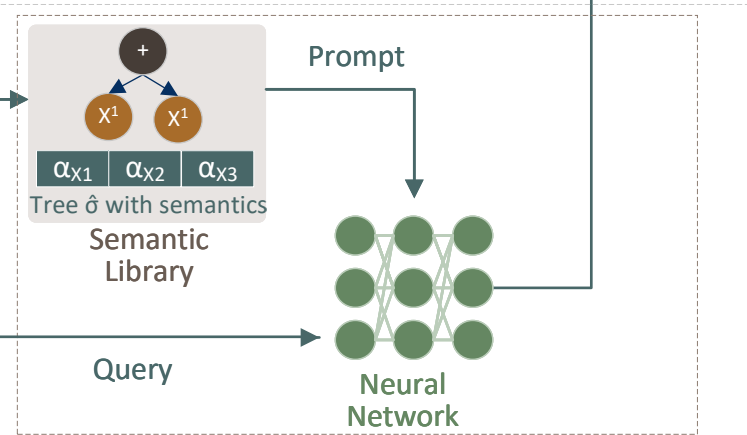
Neural Network with Retrieval
Augmentation to Generate a New Tree

Retrieval Augmented Neural Generation
(Semantic/Output Space)