CSE Example
Example

Three address code

\[
\begin{align*}
T1 &= A + B \\
T2 &= T1 + C \\
T3 &= A + B \\
C &= T1 + T2 \\
T4 &= T1 + C \\
D &= T3 + T2
\end{align*}
\]

Available expressions:
Example

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Optimized code

\[
T1 = A + B
\]

Available expressions: [A+B, T1]
Example

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Optimized code

\begin{align*}
  T1 &= A + B \\
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Available expressions: \([A+B, T1] [T1+C, T2]\)
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Available expressions: \([A+B, T1], [T1+C, T2], [T1+T2, C]\)

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Optimized code

T1 = A + B
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Available expressions: [A+B, T1], [T1+T2, C], [T1+C, T4]
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Available expressions: \([A+B, \ T1], \ [T1+T2, \ C], \ [T1+C, \ T4], \ [T3+T2, \ D]\)

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what about $A = A + B$ ?
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- no available expression!
missed opportunity?

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Available expressions: [A+B, T1], [T1+T2, C], [T1+C, T4], [T3+T2, D]

Optimized code

T1 = A + B
T2 = T1 + C
T3 = T1
C = T1 + T2
T4 = T1 + C
D = C

Need an optimization called Global Value Numbering (GVN)
next: the trouble of aliasing