MATRX

MATRIX MANIPULATION LANGUAGE

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MOTIVATION

Machine learning is now more prevalent than ever, with 51% of enterprises deploying ML

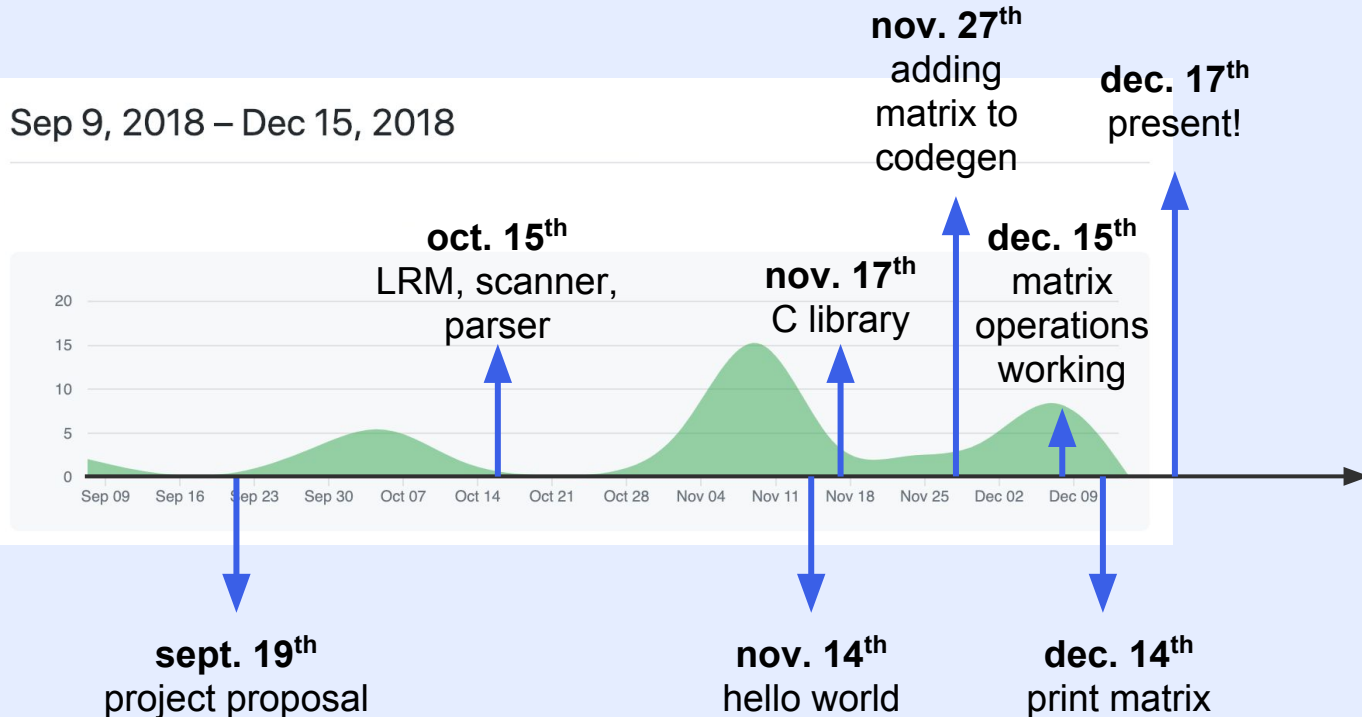Matrix manipulations are often essential to machine learning algorithms

PROJECT WORKFLOW: TIMELINE

MATRX

Sep 9, 2018 – Dec 15, 2018

oct. 15th
LRM, scanner, parser

nov. 17th
C library

nov. 27th
adding matrix to codegen

dec. 15th
matrix operations working

dec. 17th
present!

sept. 19th
project proposal

nov. 14th
hello world

dec. 14th
print matrix

ARCHITECTURE:
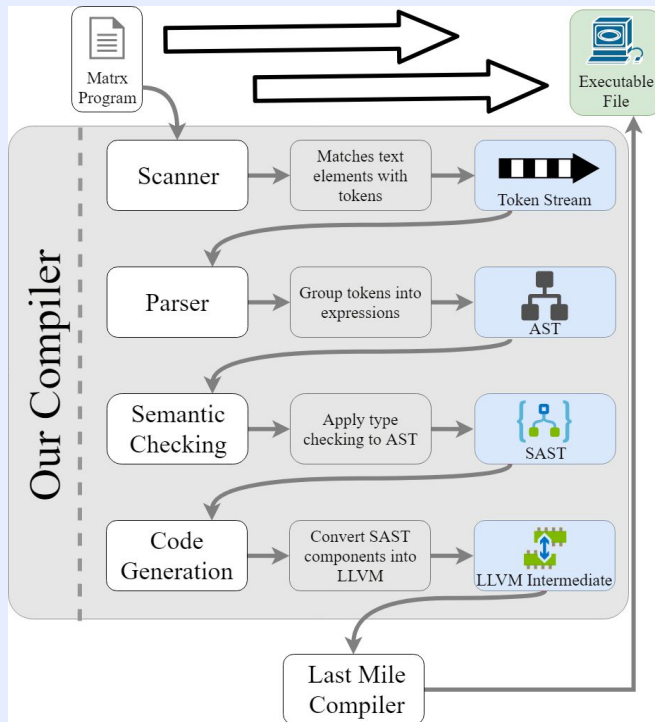
LANGUAGE OVERVIEW:

MATRX

function declarations:
```
int main() { return 0; }
matrix foo(matrix m) { return m; }
```

control flow
```
for (i = 0; i < 5; i = i + 1) {}
while (i > 5) {}
if(i == true) {} else {}
```

comments
```
/* this is a comment
in MATRX */
```

non-matrix types
```
int, bool, void,
float, string, char
```

operators
```
+, -, *, /, %, >, <,
>=, <=, ==
```

LANGUAGE OVERVIEW: MATRICES

MATRX

matrix declaration:

```
matrix m; /* declares a matrix m */
```

matrix initialization:

```
matrix m = [[1,2][3,4]]; /* declares and initializes m */
matrix n; /* declares a matrix n */
n = [[5,6][7,8]]; /* initializes n */
```

LANGUAGE OVERVIEW: MATRICES

<u>matrix arithmetic operations:</u>

```
matrix m = [[1,2][3,4]];
matrix n = [[5,6][7,8]];
printm(transpose(m)); /* prints the matrix m transposed */
printm(matmult(m,n)); /* multiplies matrix m by matrix n */
printm(matadd(m,n)); /* adds matrices m and n */
printm(dot(m,n)); /* takes the dot product of m and n */
printm(det(m,2)); /* takes the determinant of m, which has
dimensions 2 x 2 */
```
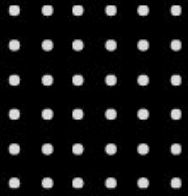
IMPLEMENTATION: MATRICES

We used a C library to implement matrix functions and then linked the library through codegen.

```
struct matrix {
 int num_rows;
 int num_cols;
 int** matrixAddr;
 int buildPosition;
};
```

TESTING:

- At any given point, each new feature in codegen is semantically checked

- Used regression test suite with target pass/fail test cases, ensure that other features still worked

- If necessary, perform manual checks