Andrew’s Part for Alan Turing:

Alan Turing was born on June 23, 1912 in London England. Turing was instrumental in the development of not only Linear Algebra, but was also known as the ‘Father of Computer Science’. Turing was the second and last child born between the couple of John Robert Turing and Ethel Sara, his eldest brother, John Turing was born 4 years before Alan was.

From 1931 to 1934 Turing attended King’s College in Cambridge. There, Turing studied as an undergrad in mathematics and was elected as a fellow of King’s. He was elected on the basis of dissertation in a proof regarding the central limit theorem. In 1936 Turing published a paper regarding a theoretical model for the Turing Machine. In this paper Turin, reformulated the works of Kurt Gödel’s results in 1931 regarding with his own hypothetical devices known as the Turing Machine. In the same paper, Turing proved that his theoretical machine would be able to compute any mathematical operation as long as it was representable as an algorithm. It can be argued that the central concept of modern computers was created because of Turing’s paper.

Shortly afterwards from September 1936 – July 1938, under Alonzo Church, Turing studied at Princeton University. Church published a similar proof before Turing’s but his was using lambda calculus. Not only did Turing study mathematics, but he also studied cryptology. Which would prove to be useful in the years to come.

During World War 2, Turing was fundamental in cracking the German Enigma machine. The Enigma machine, a cipher generator allowed the German order to communicate using ‘unbreakable codes’, essentially encrypting their communications. Turing created a machine that he named ‘the bombe’, which after a few refinements was used to successfully decrypt the Enigma encrypted messages.

After the war between 1945 and 1947, Turing joined the National Physical Laboratory. While at the NPL Turing was instrumental in the conception of the ACE (Automatic Computing Engine). Turing worked on both the logical and practical design of the ACE. Despite the enthusiasm when the proposal was first presented, there were not enough resources in order to turn Turing’s machine into reality. Around the end of 1947, Turing left the NPL to return to Cambridge, the first ACE was being built without him. Turing also created the Turing test, a test designed to distinguish machine behavior from humans.

Alan Turing died on June 7, 1954. The cause of his death was the result of a suicide most likely as a result of his conviction of indecency. To add context, Turing was a homosexual, at that time homosexual acts were banned in the United Kingdom at that time. Turing started a relationship with a man named Arnold Murray around January 1952. On January 23, Turing’s house was burglarized and Murray told Turing that he knew who the perpetrator was. As a result they reported the burglary to the police and sometime into the investigation, Turing admitted that he and Murray had a sexual relationship. Both Turin and Murray were charged with gross indecency. Turin pleaded guilty and was forced to undergo hormonal treatment in order to avoid going to jail. The treatment resulted in Turing becoming impotent and developing Gynecomastia. The drugs used in the treatment also caused profound depression. Murray on the other hand was given a conditional discharge. As a result of Turing’s conviction he lost his security clearance and was barred from the Government Communication Headquarters. He was denied entry into the United States as a result as well. He was found dead in bed by his house-keeper. There was a half-eaten apple, on his bedside table. He had died from cyanide poisoning.

Philip’s part:

In 1948, shortly after the end of WWII, Allan Turing invented a method of solving matrixes called the LU decomposition. This method of solving a matrix involves factoring a matrix (A) into two sub-matrixes (L, U), such that when multiplied together, (L \* U) return the original matrix (A). In this method, matrix L and matrix U are both triangle matrixes, meaning all values in matrix L that are above the main diagonal are 0, and all values bellow the main diagonal in matrix U are 0.

For example:

[[a11, a12, a13], [[1, 0, 0], [[u11, u12­, u13],

[a21, a22, a23], == [l21, 1, 0], \* [0, u22, u23],

[a31, a32, a33]] [l31, l32, 1]] [0, 0, u33]]

LU Decomposition is a technique used in many ways in Linear algebra. The technique can be used in place of Gaussian elimination when solving a system of linear equations, it can be used when solving for the inverse of a matrix, and it can be used to when computing the determinant of a matrix.

We use this technique in place of Gaussian elimination because it removes the need for forward and backward substitution when solving a system of linear equations. It breaks the system down into two much simpler systems, making it much quicker to solve. However, we still need to use Gaussian elimination or an equivalent technique to reduce the matrix to a point where we can factor it.

COMMENT – This can probably have all the actual math cut out of it, because this is just getting into vaguely explaining the idea of big-oh, which is going off on a tangent that isn’t important for this class.

Because LU decomposition is such a quick technique for solving a system of linear equations, this is the algorithm that almost all modern software will use to solve a system or linear equations. The algorithm has a complexity of 3 where *n* is the size of matrix A. This is a notation used to describe the number of operations required to complete a mathematical algorithm. For instance, given a 2x2 square matrix A, A will have a size of 4, so the number of operations required to solve will be

Sources:

<https://micromath.wordpress.com/2011/07/18/alan-turing-and-linear-algebra/>

<http://www.dam.brown.edu/people/mchb/la/lu.pdf>

<http://www.geeksforgeeks.org/l-u-decomposition-system-linear-equations/>

<https://en.wikipedia.org/wiki/LU_decomposition>