Matlab End to End System Model of Index Coding

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Structure

- Main: EndtoEnd
  - Signal
  - Prepare
  - APIndexCoding
  - Choose
  - Known
  - Receiver
  - Check

EndtoEnd

- EndtoEnd(N)
- N = size of wanted sqaure matrix
- Calls all the other subroutines
- Plots average min rank with P
  - P .1 to .6 with steps of .05
- Takes average min rank and error of 500 runs with P
- Plots average min Rank/P and average error/P

Signal

- [M, T] = Signal(N, P)
- Takes N (matrix size) and P
- Returns NxN matrix, M, with either 1 or 0 in diagonal and either NaN or 0 else based on P
- Returns T, N sized vector, with random numbers ranging from 0 to set number

Prepare

- [UpM]=Prepare(M)
- Takes matrix, M, from Signal
- Returns Updated Matrix, UpM, with no 1s in diagonal
- Eliminates row/column of diagonals with 1
- Simulates a receiver already having wanted message

APIndex Coding

- [Rmin,M]=APIndexCoding(UpM)
- Takes Updated matrix, UpM
- Returns min rank of matrix
- Returns min ranked Matrix, M

Choose

- [Xp]=Choose(M, Rmin, T)
- Takes matrix, M, Min rank, Rmin, and message, T
- Returns Xp
- Xp is a non-zero vector that is the message the receivers will get and have to decode
- Xp is generated using SVD

Known

- [A] = Known(UpM, T)
- Uses original matrix, UpM, and message, T
- Makes NxN sized matrix, A, with the receivers known message values in the correct spot
- Returns A

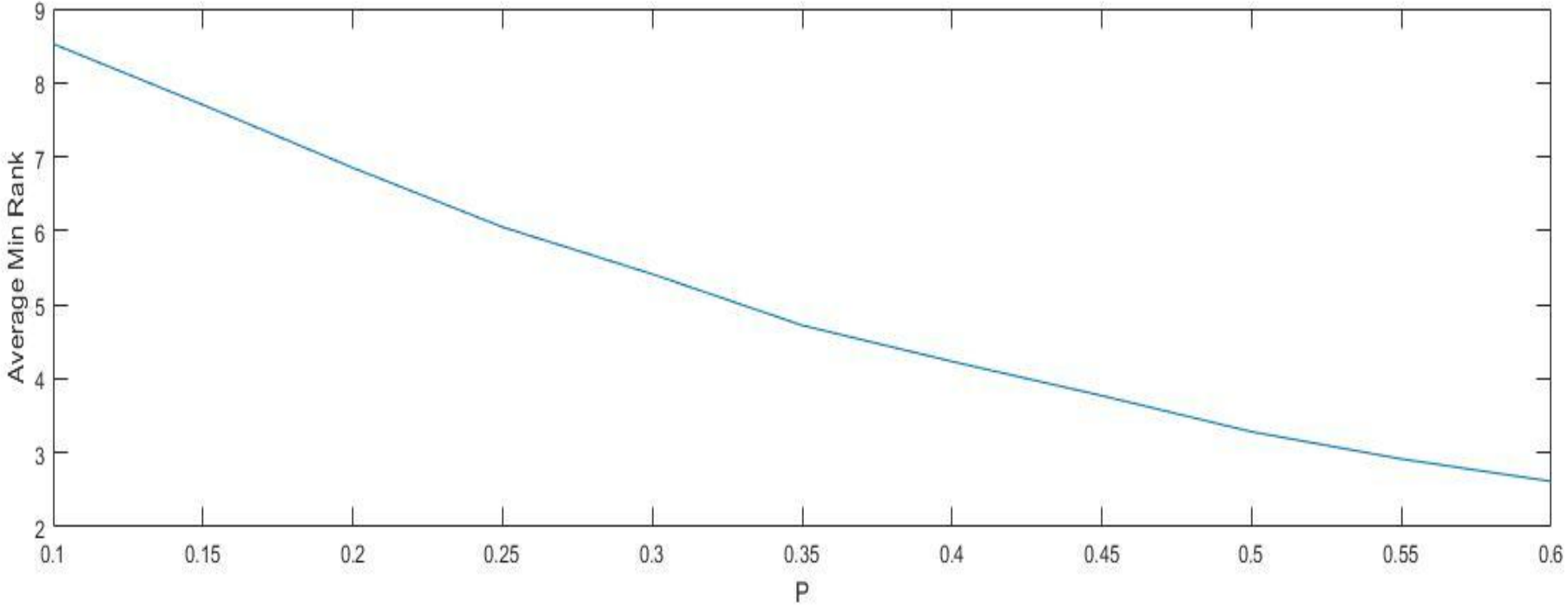
Receiver

- [Tgot] = Receiver(Xp, M, A)
- Takes transmitted message, Xp, matrix, M, and known message matrix, A
- Uses SVD to return Tgot, the messages the receivers decoded

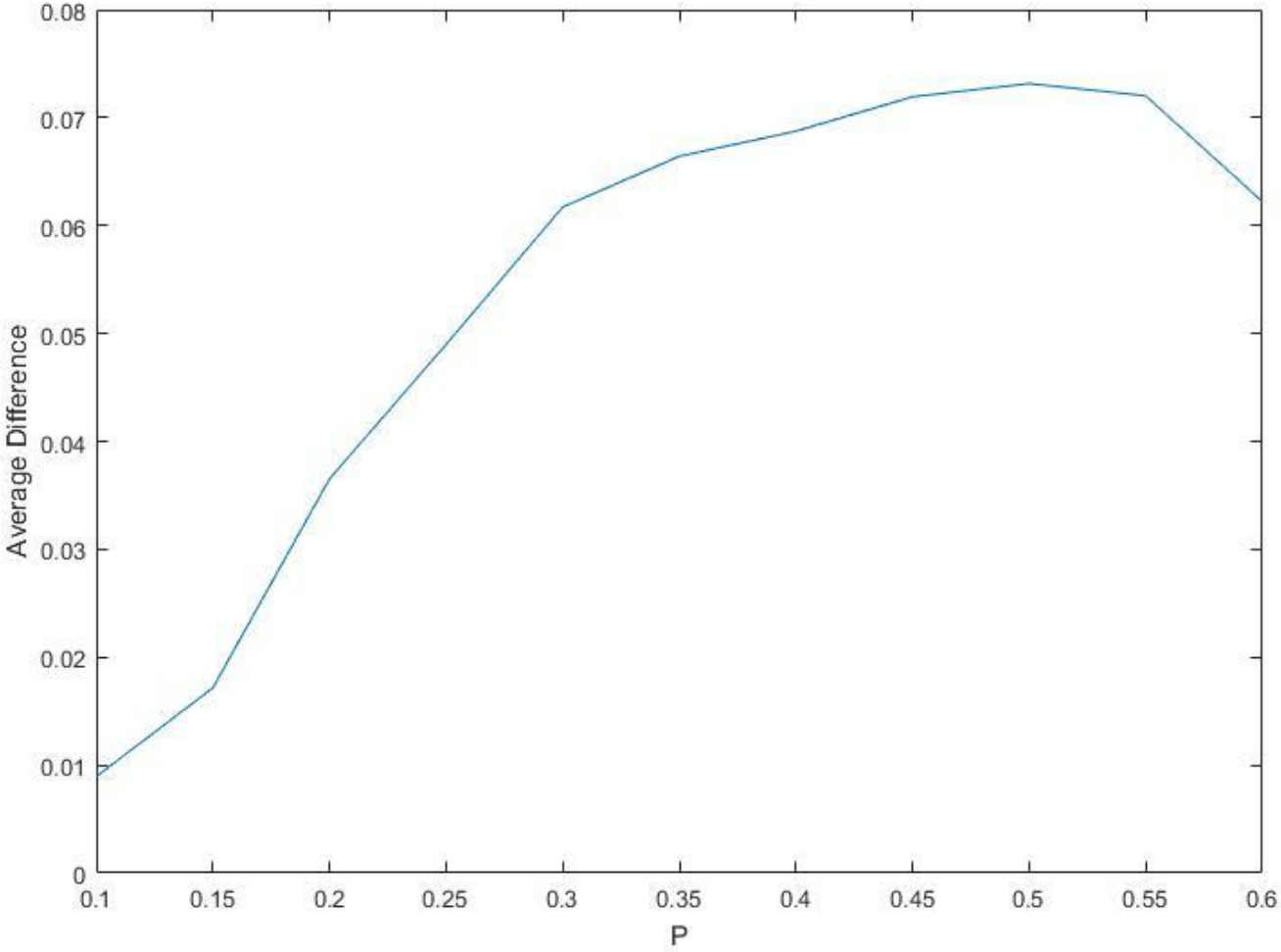
Check

- [Error] = Check(Tgot, T)
- Takes messaged received, Tgot, and original message, T
- Returns the average absolute difference between the messages

Average Min Rank Vs P for 500 iterations, N = 10



Average Error for N = 10, 500 Iterations, Random Integers ranging from 0-1000


0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Average Difference
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
P