11/4/19

**Discrete Outcome**: 1, 2, 3, 4, 5, 6

**Events**
- \( E_1 = \{ 2, 4, 6 \} \)
- \( E_2 = \{ 3, 5 \} \)

**Prime**
- \( P(E_2) = \frac{1}{2} \)

**Continuous Outcome**

**Weight** \( \sigma = 50 \)

- \( E_1 = \{ \omega \mid 50 \leq \omega \leq 60 \} \)
- \( E_2 = \{ \omega \mid 52 \leq \omega \leq 58 \} \)

**Probabilities**
- Fair Die: \( p(1) = \frac{1}{6} \)
- \( p(2) = \frac{1}{6} \)
\[ P(E_1) = \frac{1}{2} \]
\[ P(E_2) = \frac{1}{2} \]
\[ P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 E_2) \]
\[ \frac{5}{6} = \frac{1}{2} + \frac{1}{2} - \frac{1}{6} \]

**UNRELIABLE CHANNEL**

\[ \begin{align*}
&0 \quad \rightarrow \quad 0 \\
&i \quad \rightarrow \quad l \\
&-P(E_0 \cap P\text{ERROR}) = -0.01 \\
&+ 0.989 R \\
&\text{PL} \quad \rightarrow \quad 939 \\
&P(R=1|T=1) = 939 \end{align*} \]
Make it more reliable. Transmit 3 times, vote.

\[ \text{XMIT 000 RCV 001} \]

\[ \text{Error} \]

\[ \text{P(ALL 3 RCV OK) = 0.999}^3 \]

\[ \text{P(1st BIT BAD, 2nd & 3rd GOOD)} \]

\[ \text{P(1st BIT BAD)} = 0.009 \]

\[ \text{P(2nd BIT BAD)} = 0.001 \]

\[ \text{P(3rd BIT BAD)} = 0.000009 \]

\[ \text{P(ANY BIT RECEIVED WRONG)} = 0.0096 \]

\[ \text{P(0 OR 1 BAD BITS)} = 0.99997 \]

See wiki

Assumes independence.
4 WHEELS  \( P(\text{FLAT}) = .01 \)

\( P(\text{CAR DISABLED}) ? \)

\( P(\text{NO FLAT}) = .99 ^4 = .96 \)

**Car is less reliable than each tire**

**All 4 tires must work**.