Use the R function that calculates a p-value for your method to determine the (approximate) power under the several scenarios described below. We will use Monte Carlo simulation on 100 replicates of 11 different scenarios to approximate the Type II error (and hence power). You can model your R code after the file Cmax\_power.R

You should turn in a copy of the table provided to me by the date indicated. Additionally, you should keep a copy for your records (to use for the final report). Further, be sure to understand why using Monte Carlo methods such as this can be used to approximate power of a hypothesis test for a given alternative hypothesis scenario.

Scenario 1: Negative Pairwise Correlations

i) Short Song

200 notes per song

Each song was generated using a probability model with:

Overall (i.e. marginal) Probability of missing a note is p=0.3

Correlation between note *i* and *i+1* for *i=1, …,199* (i.e. any 2 consecutive notes) is   
**= -0.3

ii) Long Song

Identical to the Short Song but with 600 notes per song

Scenario 2: Sections (Blocks) with different difficulty

iii) Short Song

200 notes per song

Each song has easy, medium, hard, and very hard sections and was generated using a probability model with:

Probability of missing a note in an easy section is p=0.01

Probability of missing a note in a medium section is p=0.05

Probability of missing a note in a hard section is p=0.25

Probability of missing a note in a very hard section is p=0.5

iv) Long Song again is identical to short song but has 600 notes

Scenario 3: Autoregressive model of order 1 – denoted AR(1)

v) Short Song type 1

200 notes per song

Each song was generated using a probability model with:

Overall (i.e. marginal) Probability of missing a note is p = 0.1

Correlation between note *i* and *j* for *i,j=1, …, 200* (i.e. any 2 notes) is **= 0.5|i-j|   
(eg. Correlation between notes 1 and 2 is 0.5, between notes 1 and 3 is 0.52=0.25 and so on)

vi) Long song type 1 has 600 notes

vii) Short song type 2

200 notes per song

Each song was generated using a probability model with:

Overall (i.e. marginal) Probability of missing a note is p = 0.1

Correlation between note *i* and *j* for *i,j=1, …, 200* (i.e. any 2 notes) is **= 0.3|i-j|   
(eg. Correlation between notes 1 and 2 is 0.3, between notes 1 and 3 is 0.32=0.09 and so on)

viii) Long song type 2 has 600 notes

ix) Short song type 3

200 notes per song

Each song was generated using a probability model with:

Overall (i.e. marginal) Probability of missing a note is p = 0.2

Correlation between note *i* and *j* for *i,j=1, …, 200* (i.e. any 2 notes) is **= 0.5|i-j|   
(eg. Correlation between notes 1 and 2 is 0.5, between notes 1 and 3 is 0.52 = 0.25 and so on)

x) Long song type 3 has 600 notes

Scenario 4: Random Misses

xi) Songs of 200 random notes with p = 0.1.

Keep this copy for your records.

|  |  |  |  |
| --- | --- | --- | --- |
| Type I Error Rate 🡪  Scenario | =0.01 | =0.05 | =0.10 |
| i) Neg. Pair Corr, n=200 |  |  |  |
| ii) Neg. Pair Corr, n=600 |  |  |  |
| iii) Blocks, n=200,  pEasy=0.01, pMed=0.05, pHard=0.25,pVeryHard=0.5 |  |  |  |
| iv) Blocks, n=600,  pEasy=0.01, pMed=0.05, pHard=0.25,pVeryHard=0.5 |  |  |  |
| v) AR(1), p=0.1, **=0.5, n=200 |  |  |  |
| vi) AR(1), p=0.1, **=0.5, n=600 |  |  |  |
| vii) AR(1), p=0.1, **=0.3, n=200 |  |  |  |
| viii) AR(1), p=0.1, **=0.3, n=600 |  |  |  |
| ix) AR(1), p=0.2, **=0.5, n=200 |  |  |  |
| x) AR(1), p=0.2, **=0.5, n=600 |  |  |  |
| xi) Random notes, p=0.1 |  |  |  |

Copy to turn in.

|  |  |  |  |
| --- | --- | --- | --- |
| Type I Error Rate 🡪  Scenario | =0.01 | =0.05 | =0.10 |
| i) Neg. Pair Corr, n=200 |  |  |  |
| ii) Neg. Pair Corr, n=600 |  |  |  |
| iii) Blocks, n=200,  pEasy=0.01, pMed=0.05, pHard=0.25,pVeryHard=0.5 |  |  |  |
| iv) Blocks, n=600,  pEasy=0.01, pMed=0.05, pHard=0.25,pVeryHard=0.5 |  |  |  |
| v) AR(1), p=0.1, **=0.5, n=200 |  |  |  |
| vi) AR(1), p=0.1, **=0.5, n=600 |  |  |  |
| vii) AR(1), p=0.1, **=0.3, n=200 |  |  |  |
| viii) AR(1), p=0.1, **=0.3, n=600 |  |  |  |
| ix) AR(1), p=0.2, **=0.5, n=200 |  |  |  |
| x) AR(1), p=0.2, **=0.5, n=600 |  |  |  |
| xi) Random notes, p=0.1 |  |  |  |