Robot with Operator

1
00:00:12,379 --> 00:00:08,900
good morning or whatever it is as most

2
00:00:16,760 --> 00:00:12,389
of you will recall perhaps somewhat

3
00:00:20,420 --> 00:00:16,770
painfully for the entire history of this

4
00:00:25,130 --> 00:00:20,430
noble organization we have rated before

5
00:00:28,640 --> 00:00:25,140
you and in your journal never-ending

6
00:00:32,600 --> 00:00:28,650
sequence of human machine anomalies

7
00:00:39,040 --> 00:00:32,610
experiments most of them I would like to

8
00:00:42,680 --> 00:00:39,050
think were squeaky clean well conceived

9
00:00:47,029 --> 00:00:42,690
with protocols protected against

10
00:00:51,080 --> 00:00:47,039
artifact large databases diligent

11
00:00:52,880 --> 00:00:51,090
operators seaworthy analytical business

12
00:00:57,139 --> 00:00:52,890
the whole nine yards good and clean

13
00:00:59,599 --> 00:00:57,149

experiments this is not the case of the

14
00:01:01,689 --> 00:00:59,609
topic I'm going to describe to you today

15
00:01:05,270 --> 00:01:01,699
quite the contrary

16
00:01:09,399 --> 00:01:05,280
this particular study I would have to

17
00:01:12,429 --> 00:01:09,409
regard as being quite sloppy nonetheless

18
00:01:16,280 --> 00:01:12,439
it revealed some rather interesting

19
00:01:19,340 --> 00:01:16,290
evidence that you may be interested in

20
00:01:24,370 --> 00:01:19,350
and you may even enjoy the sloppiness of

21
00:01:29,050 --> 00:01:24,380
the experiment in that array of

22
00:01:33,890 --> 00:01:29,060
experimental efforts that I alluded to

23
00:01:40,999 --> 00:01:33,900
one of the more active ones involves and

24
00:01:46,789 --> 00:01:41,009
a random robot you have most of you seen

25
00:01:49,100 --> 00:01:46,799
this guy in fact some of our co-authors

26
00:01:52,940 --> 00:01:49,110
and staff people are in his honor

27
00:01:55,249 --> 00:01:52,950
wearing t-shirts today with his image on

28
00:01:58,160 --> 00:01:55,259
them you will notice this Brenda has won

29
00:02:01,160 --> 00:01:58,170
on over it back at the room lisa has won

30
00:02:04,240 --> 00:02:01,170
on and I think there even a couple of

31
00:02:07,880 --> 00:02:04,250
others York is wearing his robot t-shirt

32
00:02:09,859 --> 00:02:07,890
this little guy is maybe yeah and I

33
00:02:13,520 --> 00:02:09,869
entered 10 inches in diameter he looks

34
00:02:16,580 --> 00:02:13,530
like a little samboni machine

35
00:02:20,030 --> 00:02:16,590
the froggy on a perched on the profit as

36
00:02:23,090 --> 00:02:20,040
the driver of this thing has a story all

37
00:02:25,040 --> 00:02:23,100
his own that I can't take time for but

38
00:02:31,150 --> 00:02:25,050

what happens here is there is an onboard

39
00:02:36,130 --> 00:02:31,160
re G and a processor yeah a code that

40
00:02:38,900 --> 00:02:36,140
communicates the output of that random

41
00:02:41,740 --> 00:02:38,910
processor into a set of instruction

42
00:02:44,450 --> 00:02:41,750
that's for the robot tells it move ahead

43
00:02:46,850 --> 00:02:44,460
turned it all right turn to the left and

44
00:02:50,000 --> 00:02:46,860
better yet tell us it how much to mow if

45
00:02:52,790 --> 00:02:50,010
I hadn't how much - how much to turn and

46
00:02:55,820 --> 00:02:52,800
so the thing executes a random

47
00:02:57,830 --> 00:02:55,830
2-dimensional walk on this table and the

48
00:03:00,380 --> 00:02:57,840
experiments have consisted of an

49
00:03:03,410 --> 00:03:00,390
operator and this is not the operator of

50
00:03:06,590 --> 00:03:03,420
these particular studies sitting

51
00:03:09,880 --> 00:03:06,600
adjacent to this platform in this table

52
00:03:12,770 --> 00:03:09,890
that's about four feet diameter and

53
00:03:15,400 --> 00:03:12,780
trying to induce the random motion of

54
00:03:18,830 --> 00:03:15,410
the thing to do with something anomalous

55
00:03:21,680 --> 00:03:18,840
eventually of course the the little

56
00:03:24,860 --> 00:03:21,690
froggie machine will tumble off the edge

57
00:03:28,880 --> 00:03:24,870
of the table and one set of protocols we

58
00:03:30,770 --> 00:03:28,890
believe we operated simply was can you

59
00:03:32,990 --> 00:03:30,780
get the machine to go off the other side

60
00:03:35,930 --> 00:03:33,000
or you can get it to come off on your

61
00:03:39,290 --> 00:03:35,940
side others we actually looked at the

62
00:03:42,170 --> 00:03:39,300
angles of exit or we'd say keep it on

63
00:03:45,290 --> 00:03:42,180

the table longer or get it off the table

64
00:03:49,070 --> 00:03:45,300
more promptly and and we've published on

65
00:03:50,830 --> 00:03:49,080
this theory references of available for

66
00:03:54,350 --> 00:03:50,840
those of you who want to follow that

67
00:03:57,259 --> 00:03:54,360
however the story now shifts into the

68
00:03:59,740 --> 00:03:57,269
present tense we were in the process

69
00:04:02,600 --> 00:03:59,750
somewhat of over a year and all of

70
00:04:05,600 --> 00:04:02,610
buttoning up the laboratory after 28

71
00:04:07,610 --> 00:04:05,610
years as we described last last year

72
00:04:10,479 --> 00:04:07,620
this meeting we actually decided to

73
00:04:13,370 --> 00:04:10,489
close down the university based

74
00:04:17,000 --> 00:04:13,380
experimental program and we were in the

75
00:04:21,949 --> 00:04:17,010
process packing up equipment unplugging

76
00:04:25,040 --> 00:04:21,959
stuff all sorts of moving personnel were

77
00:04:25,580 --> 00:04:25,050
coming in and out the idea of doing a

78
00:04:28,159 --> 00:04:25,590
control

79
00:04:31,490 --> 00:04:28,169
experiment was beyond question we had

80
00:04:34,310 --> 00:04:31,500
however working with us a student intern

81
00:04:38,360 --> 00:04:34,320
very interesting Chapman I don't want to

82
00:04:41,140 --> 00:04:38,370
violate his his anonymity but this was a

83
00:04:43,850 --> 00:04:41,150
fellow of regal worth from the African

84
00:04:46,909 --> 00:04:43,860
continent would spent time in France

85
00:04:51,310 --> 00:04:46,919
very articulate very medical student

86
00:04:54,050 --> 00:04:51,320
we'd been doing odd jobs with asana on a

87
00:04:57,290 --> 00:04:54,060
work-study program we came to me and

88
00:04:59,719 --> 00:04:57,300

said I love that robot experiment you

89
00:05:03,409 --> 00:04:59,729
did can I do I said that I was

90
00:05:05,810 --> 00:05:03,419
experiments I said this thing is is

91
00:05:08,409 --> 00:05:05,820
buttoned up it's in a box it doesn't

92
00:05:11,770 --> 00:05:08,419
work very well we've only used it for

93
00:05:15,050 --> 00:05:11,780
demonstration purposes no I want to try

94
00:05:18,469 --> 00:05:15,060
so a member of our senior staff when I

95
00:05:20,659 --> 00:05:18,479
think you can can guess and I said all

96
00:05:24,379 --> 00:05:20,669
right fine we haul it out we'll set it

97
00:05:26,560 --> 00:05:24,389
up again and we'll calibrate it and do

98
00:05:30,379 --> 00:05:26,570
the best we can to make it work and

99
00:05:32,390 --> 00:05:30,389
we'll run this person said I'll run one

100
00:05:35,260 --> 00:05:32,400
set of active trials and see what

101
00:05:37,790 --> 00:05:35,270
happens see if it's still viable and

102
00:05:39,560 --> 00:05:37,800
indeed it was as you will see in a

103
00:05:41,870 --> 00:05:39,570
moment and then handed and under the

104
00:05:47,990 --> 00:05:41,880
student who went on to do a much more

105
00:05:52,480 --> 00:05:48,000
extensive sequence of results now the

106
00:05:55,909 --> 00:05:52,490
results that this these two operators

107
00:05:58,640 --> 00:05:55,919
acquired is on this table you don't want

108
00:06:01,129 --> 00:05:58,650
to try to digest any of that I show it

109
00:06:04,279 --> 00:06:01,139
to you only so you're familiar with my

110
00:06:08,719 --> 00:06:04,289
nomenclature the two operators relabeled

111
00:06:11,180 --> 00:06:08,729
x and y the x was the senior in

112
00:06:16,190 --> 00:06:11,190
laboratory person may why was the

113
00:06:18,339 --> 00:06:16,200

student X did series a why did series B

114
00:06:19,460 --> 00:06:18,349
C and D and then there are these various

115
00:06:21,950 --> 00:06:19,470
concatenations

116
00:06:24,589 --> 00:06:21,960
and when the data we collected were the

117
00:06:27,170 --> 00:06:24,599
number of trials the number that went in

118
00:06:31,460 --> 00:06:27,180
the desired direction and then a bunch

119
00:06:33,740 --> 00:06:31,470
of observational parameters the total

120
00:06:37,399 --> 00:06:33,750
time it stayed on the table at secretary

121
00:06:38,780 --> 00:06:37,409
etc I should hastily interject that we

122
00:06:41,390 --> 00:06:38,790
decided just to get

123
00:06:44,660 --> 00:06:41,400
sitting on with as simply as possible

124
00:06:47,570 --> 00:06:44,670
you'd only do one protocol and that was

125
00:06:49,970 --> 00:06:47,580
the time of flight protocol get it off

126
00:06:52,640 --> 00:06:49,980
the table as quickly as possible those

127
00:06:54,770 --> 00:06:52,650
would be the short trials leave it on

128
00:06:57,290 --> 00:06:54,780
the table as long as you can though this

129
00:06:59,990 --> 00:06:57,300
would be the long files so we've got the

130
00:07:02,060 --> 00:07:00,000
average times the flight of an under

131
00:07:05,240 --> 00:07:02,070
these various conditions the

132
00:07:08,270 --> 00:07:05,250
distributions of those times some of the

133
00:07:10,850 --> 00:07:08,280
necessary statistical parameters the

134
00:07:13,430 --> 00:07:10,860
standard deviations and so on which

135
00:07:16,670 --> 00:07:13,440
permit us to calculate the t-squares

136
00:07:19,130 --> 00:07:16,680
the z-score is the probabilities against

137
00:07:24,620 --> 00:07:19,140
chance the Flex sizes are all that good

138
00:07:27,710 --> 00:07:24,630

stuff now I should again add that that

139
00:07:29,540 --> 00:07:27,720
all of this was done with people moving

140
00:07:32,390 --> 00:07:29,550
equipment through the laboratory

141
00:07:37,090 --> 00:07:32,400
jostling the table at one point the

142
00:07:42,040 --> 00:07:37,100
overhead camera that gaybies recorded

143
00:07:47,870 --> 00:07:46,040
got jostle wouldn't work anymore so I've

144
00:07:50,660 --> 00:07:47,880
said that a student look we've got to

145
00:07:53,270 --> 00:07:50,670
finish this get yourself a stopwatch and

146
00:07:56,870 --> 00:07:53,280
the poor kids that their timing the

147
00:08:00,020 --> 00:07:56,880
trials with a stopwatch and here are our

148
00:08:02,270 --> 00:08:00,030
data now and that's all the bad news but

149
00:08:06,230 --> 00:08:02,280
the good news is he got some striking

150
00:08:09,380 --> 00:08:06,240
effects as we will display a little or

151
00:08:13,100 --> 00:08:09,390
fasoli on this illustrative graph now

152
00:08:16,880 --> 00:08:13,110
here are operators again x and y here

153
00:08:20,260 --> 00:08:16,890
are this series they did a b c d and

154
00:08:23,870 --> 00:08:20,270
some of the combinations there up the

155
00:08:28,070 --> 00:08:23,880
the blue things the violet things here

156
00:08:30,950 --> 00:08:28,080
are the are the z-scores as computed by

157
00:08:35,030 --> 00:08:30,960
the usual statistical methods and he's

158
00:08:37,190 --> 00:08:35,040
magenta bars are the effect size i mean

159
00:08:39,920 --> 00:08:37,200
we can talk if you like how we compute

160
00:08:44,420 --> 00:08:39,930
an effect size in this experiment and

161
00:08:46,760 --> 00:08:44,430
look what happened our operator x did

162
00:08:48,800 --> 00:08:46,770
extraordinarily well but a green line

163
00:08:51,450 --> 00:08:48,810

that goes horizontally across here is

164
00:08:54,400 --> 00:08:51,460
the conventional 0.05

165
00:08:57,100 --> 00:08:54,410
statistical significance arbitrary

166
00:08:59,860 --> 00:08:57,110
criteria all right well he's punched way

167
00:09:02,260 --> 00:08:59,870
for really that the effect sizes way up

168
00:09:05,470 --> 00:09:02,270
here are beyond things we normally see

169
00:09:07,660 --> 00:09:05,480
and bear in mind please throughout these

170
00:09:10,600 --> 00:09:07,670
are all differential measurements we are

171
00:09:13,990 --> 00:09:10,610
distinguishing on this klutzy system

172
00:09:16,840 --> 00:09:14,000
between the long trial efforts the short

173
00:09:19,780 --> 00:09:16,850
trial efforts and not collectively so

174
00:09:22,960 --> 00:09:19,790
much as individually these data are the

175
00:09:26,470 --> 00:09:22,970
differences in adjacent trials tries to

176
00:09:29,260 --> 00:09:26,480
go high it's a time tries to go low it's

177
00:09:31,630 --> 00:09:29,270
a time subtract the number that's the

178
00:09:34,630 --> 00:09:31,640
measurable okay and obviously we

179
00:09:38,380 --> 00:09:34,640
alternate the sequence of these now

180
00:09:41,320 --> 00:09:38,390
comes to student series B that's very

181
00:09:44,920 --> 00:09:41,330
well also passed the significance

182
00:09:47,769 --> 00:09:44,930
criteria again big effect sizes then he

183
00:09:50,800 --> 00:09:47,779
does a second series and the poor guy

184
00:09:54,070 --> 00:09:50,810
goes backwards classical slime is

185
00:09:56,230 --> 00:09:54,080
phenomena way down here and he's trying

186
00:09:58,390 --> 00:09:56,240
to go high he's going lower he's trying