# Datacasting, an Opportunity in Educational Equity

New Mexico

Supercomputing Challenge

Final report

April 4, 2022

Team 10

Taos High School

# **Team Members**

Athanasios Bertin

Carlos Miller

Grace Goler

Lakai Tucker

Lola Shropshire

# Teacher

Tracy Galligan

# **Project Mentor**

Pedro Escobar

# **Executive Summary**

Our project attempted to demonstrate the connection between the COVID-19 pandemic and levels of educational success within the state of New Mexico; while simultaneously showing a possible benefit to the implementation of Datacasting. Datacasting is a form of one-way communication transmitted through television stations. Receivers give access to a periodically updated educational library without the need for a broadband internet connection. Our connections would be determined using Python w/ TensorFlow by creating a linear regression model. Data for this model was supposed to come from localized sources (broadband availability, educational success metrics, etc.) but data collected by localized sources was inconsistently produced and not available for the model. Instead, our model used hypothetical data derived from known NMPED data.

#### **Project Statement**

Due to economic and residential inequities, many students cannot access broadband internet. Students have an unfair disadvantage compared to others with unlimited access to broadband.

#### Description

The solution to the problem is drawn from collected data, training models, and testing against a variety of scenarios. Examples of scenarios for testing include; economic status, access to broadband internet, and access to Datacasting. With these scenarios and educational success metrics (SAT/ACT scores, state testing proficiency, and graduation rate) we can feed the data into a linear regression model. The mode can later be upgraded to a non-linear model for greater accuracy. In simple terms, the model will allow students without access to internet to download and edit documents for school or work.

## Results

The expected results should be the same regardless of data, and should equal a model capable of presenting the educational success of New Mexican students over time and with differing scenarios. If we could continue to next year, we would increase our advertising and checking in more frequently. We would also like to add a Raspberry Pi to the receivers to receive accurate information on download speed and location.

#### Conclusion

Our team has produced visualizations of processes related to Datacasting, but primarily the transmission process. The visualizations are made in Alice and NetLogo. Our team also aided

Dr. Gladys for the pilot Datacasting program in Taos county. On January 19th, 2022 we handed out receivers and antennas to the community in order to begin the pilot program. We also researched the data pertaining to educational success metrics from the NMPED and found that no data has been published for the 2020-2021 educational year. Unfortunately, Due to the lack of data provided by state sources (NMPED, 2021) and the necessary variables stated in our Meet the Scientist interview, we cannot expect a realistic and applicable model. However, theoretical data can be fitted to satisfy the lack of educational success metrics. This theoretical data and TensorFlow regression models (TensorFlow, 2022) can lead to a model capable of "predicting" future data with our theoretical data.

## **Most Significant Achievement**

Our most significant achievement of the project was actually providing families with learning opportunities. We dispensed real packages that can be used to receive Datacasting services that will give the family a chance to improve education, particularly in family literacy. This is important because so many families don't have the opportunity to receive education due to economic differences and remote locations that limit internet access. These receivers and antennas can give kids and parents alike a chance to improve their education.

#### **Software Description**

The softwares we used for this project are Python, Alice, and Netlogo. We created a diagram that illustrates a basic model of how datacasting would work. It's a pretty simple diagram that shows a starting point of how the system would work. As a slightly more complex and 3d diagram we used Alice. Alice provided us with minimal tools and an extremely basic platform, but we created a more intricate model that shows how datacasting can be used to reach

diverse locations. For a model more centered on data we used Python. As described in the executive summary, with TensorFlow we created a linear regression model. These softwares, especially Alice and NetLogo, are very basic and only provide a visual model. The Python model could be improved through actual access to data collected in the field, and long term data. To improve the visual models we could use software with a better platform. We could use a more detailed model and add moving or interactive details.

# Daring Wiuff-Esbo Import Export Import Import

## **Models and Codes**

The 3D printed pieces of our Datacasting antenna visualization.



The code that makes our small scale town representation.↑



An example home, 3D printed for our physical model.



Small-scale representation of a town in Alice, specifically demonstrating the widespread.

Image: Section of the section of t	▶ Data-casting in Net Logo - NetLogo (C:\Users\athanasiosbertin\Desktop) — □ ×	> Data-carteg in Mill type - Mi
Image: Image	Interface loss code	
Image: Image	and coc	rd. Ord (Course ) (Course )
Image: Solution of the solutio	View updates Settings	cler-All A
Image: Section of the section of	Edit Delete Add ticks:	set proler blue
Image: Section of how datacasting Works (Code included)		create-turtles 1
I was a set of the		ask turtles I
Image: Section of the section of		setty 13 30 pen-dan
I was a second a s		set hading 0 forward 1
I we have a set of the set of		set texting 45 formard 1
Image: Section of the section of	setup	set twaling 135
Image: Section of the section of		set texting 100 formard 1 or texting 200
Image: Section of the section of		found 1.3
Image: Section of the section of		La contra c
Image: Section of the section of		ist heading 0
Image: Section of the section of		roman 1 set heading 99
Image: Section of the section of		rowing 1 set wedge 100
Image: Section of the section of		toward 2 set heading 200
Image: Sector Secto		forward 1 per-up
Image: Section of the section of		sety 13 - 10 por-dom
Image: Section of the section of		set hading 0 forward 2
Image: Section of the section of		set heading 90 forward 2
Image: Section of the section of		set hading 180 forward 2
Image: Section of the section of		set hedding 270 forward 2
Image: Section of the section of		pm-ap sety -13 0
Command Center       Image: Center         Command Center       Image: Center      <		por-dom set texting 10
Image: Sector Secto	A	forard 11     v
<ul> <li>Image: Second Se</li></ul>	Command Center	
<ul> <li>► Comparison</li> <li>► Co</li></ul>		
<ul> <li>Contraction</li> <li>Contrac</li></ul>	observer >	
<ul> <li>Provide the first of the first</li></ul>		
The transmission of the	► Date-casing in Net Lo	$\leftarrow \leftarrow$ The NetLogo program with a brief
<ul> <li>A second s</li></ul>	Fie (gir Josh Zoom 1	
received 100       Representation of how datacasting         received 100       Works (Code included)         received 100       Works (Code included)		
iii diging       Representation of now datacasting         iii diging       Works (Code included)         iii diging       Works (Code included)         iii diging       Works (Code included)         iii diging       Iii diging	red. Disk    [m]	Popresentation of how datagasting
<pre>red compared com</pre>	per-up back offer	Representation of now datacasting
<pre>truits := 10     reginance := 10     regi</pre>	pen-dom forward 1.2	
interaction     Works (Code included)       interaction     interaction       inte	set basing -126 pen-up	
product     monoperation       monoperation     monoperation       monoperation <t< td=""><td>forward 3 set heading 9</td><td>Works (Code included)</td></t<>	forward 3 set heading 9	Works (Code included)
Pro-4mp           Frequent Life	pen-dom forward 3	
intending           intending <td< td=""><td>pm-up set heading 165 formed 2</td><td></td></td<>	pm-up set heading 165 formed 2	
ref valing 32           ref valing 34	rowaft 3 pen-facel	
prog         prog           RCS         prog <td>forward 4.2 set heading 105</td> <td></td>	forward 4.2 set heading 105	
if india 3 if india 3 if india 3 if india 3 if india 3 if india 4 if india 3 if ind	per-up back 9	
i et fundig 40 tet hadig 40 per feet 3 (*1 - 1: *1) tet hadig 50 forard 22 forard 22 forard 23 forard 23 forard 23 forard 24 forard 24 forard 25 forard 25 forard 25 forard 26 forard 2	set heading 99 forum 1.5	
pi ray 10         pi ray 10           format 30         pi ray 10           format 30         pi ray 10           pi ray 10         pi ray 10	set hedig 180 back 1.9	
if maning 90           front 21           if how 12           if how 13           if how 13           front 12           front 13           front 13           front 14           front 15	pd report 30 [ fd 1 rt 50 ] fromand 3	
Inverse         Inverse	ret heading 05 forward 22	
str. Narlig 132           perdent	peri-up back 22	
Fourt 12           Max           Max           Max           Max           Max           Max           Fourt 24	set heading 132 pen-down	
Boc 11	forward 31 pen-up	
product           #Finity	back 31 set heading 127.5	
pro-p           set toning 100           formal 3.3           formal 2.4           formal 2.4           formal 2.4           formal 2.4           formal 3.5	pen-dem Fromard 24	
remote 4.5         remote 4.5           ref station 9-86         remote 4.5           port-fail         remote 4.5           forward 11.5         v	pen-up set heating 180	
Profile Fund 11.3	rown 0.25 set heading -00 former 13	
	jon-dom fonard 11.5	×

#### Acknowledgments

We'd like to thank our teacher, Ms Tracy Galligan and our translator Pedro Escobar. We'd also like to thank Celia Einhorn, Ferdi Serim, Gladys Herrera for providing and assisting with the antennas and receivers.

# Sources

Buono, M., MacPherson, K., Martin, J., & Rydout, G. (2021). (rep.). Digital Sovereignty.

Miller, C., Goler, G., Tucker, L., Bertin, A., Shropshire, L., Martin, J., Buono, M., &

MacPherson, K. (2021, November 11). Datacasting Introduction. personal.

*Basic regression: Predict fuel efficiency*. TensorFlow. (n.d.). Retrieved January 25, 2022, from https://www.tensorflow.org/tutorials/keras/regression#split\_features\_from\_labels

NMPED. (2021, November 22). *Achievement Data*. New Mexico Public Education Department. Retrieved January 25, 2022, from

https://webnew.ped.state.nm.us/bureaus/accountability/achievement-data/

Miller, C., Goler, G., Tucker, L., Bertin, A., Shropshire, L., & Robey, T. (2021, November8). Meet the Scientist. Personal.

Community, N. P. (2022, January 14). NumPy User Manual. NUMFocus Inc.