



(Intro a) Inteligencia Artificial para Smart Water Management



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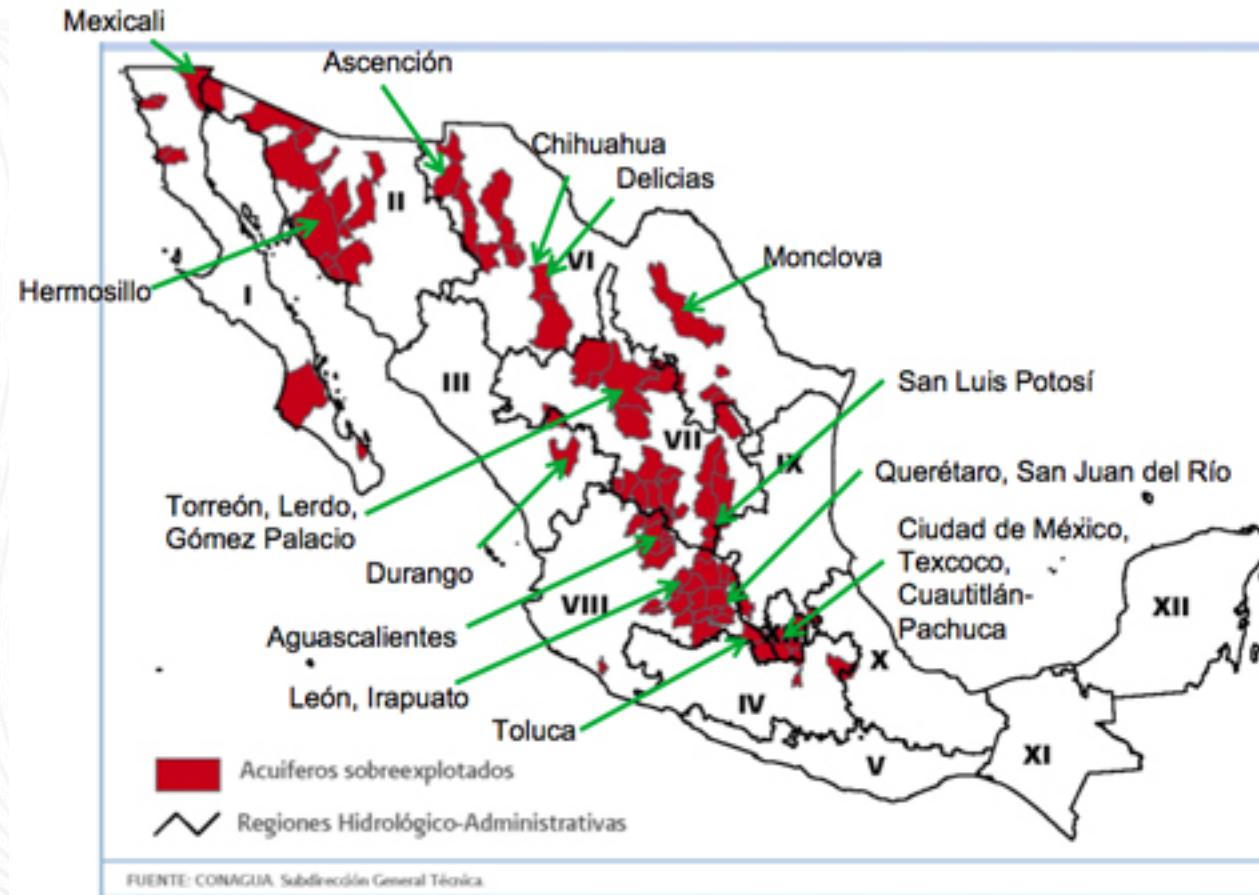


Septiembre 2020



Acuíferos en el país

104 acuíferos sobreexplotados y 69 cercanos a la sobreexplotación



Team

Dra. Carmen Julia Navarro Gómez

M.I. Martín Mauricio Alarcón Barraza

M.I. Sergio Alberto Valdés Rabelo

Dr. Miguel Ángel Medina Pérez

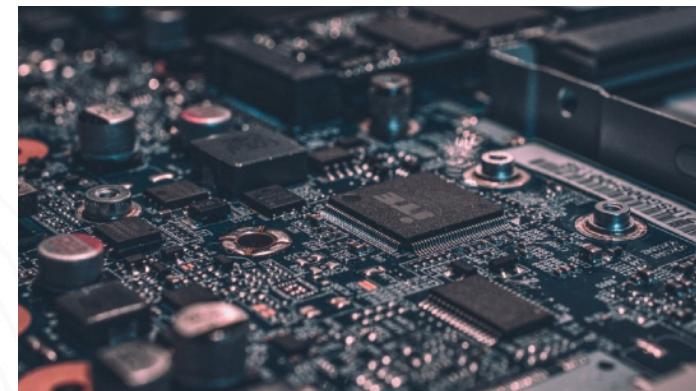
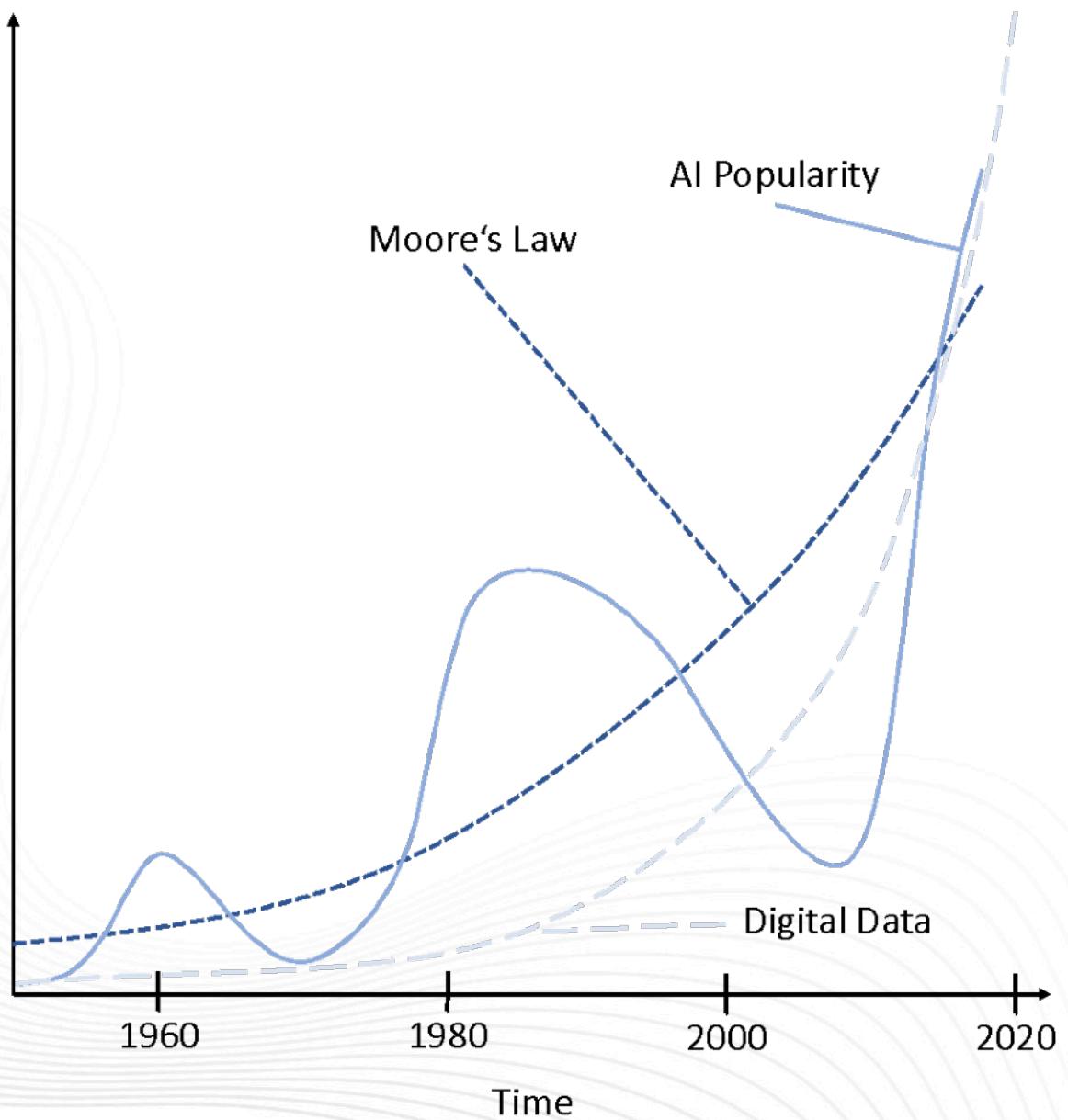
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Global Intelligent Solutions



¿Artificial Intelligence?



AI está en todos lados

2



1st

Mechanization,
water power, steam
power

2nd

Mass production,
assembly line,
electricity

3rd

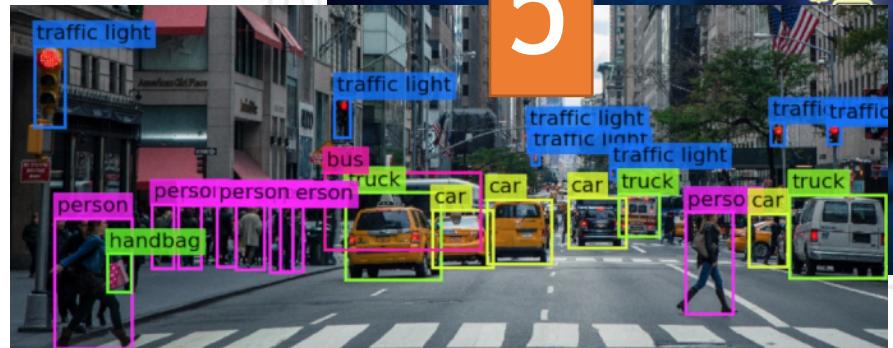
Computer and
automation

4th

Cyber Physical
Systems

3

1



5



4

Tres ejemplos

Atlas

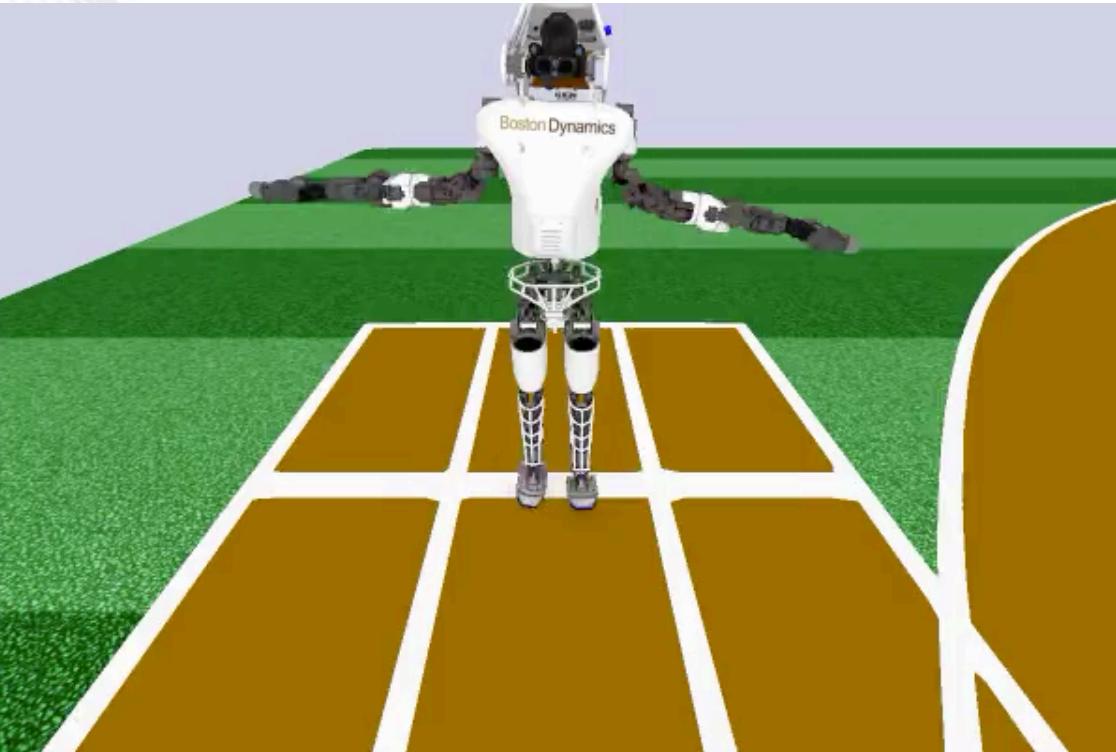
Poesía

*A butterfly in the sun
Just because I know that I should leave this
heart for you
You said I was falling apart*

*I wish I were you
I wanted you to know how I feel
I could have settled it all*

*It's time to go and do it big and you can be
my side
I can't believe it when I see you
I'm lost in the world and I can't see you cry
I'm asking you to love me then let me go
I can't stop this way*

*A butterfly in the mirror
The world will find the soul and the truth
The stars are singing the songs
I want a holiday, I want you to stay away
I need you to stay away*



Pilotear



El responsable



¿Pero qué es AI?

def·i·ni·tion

/ defə|niSH(ə)n /

noun: a statement of the exact meaning of a word.

Simulación de procesos de Inteligencia humana por parte de máquinas

¿Pero qué es AI?

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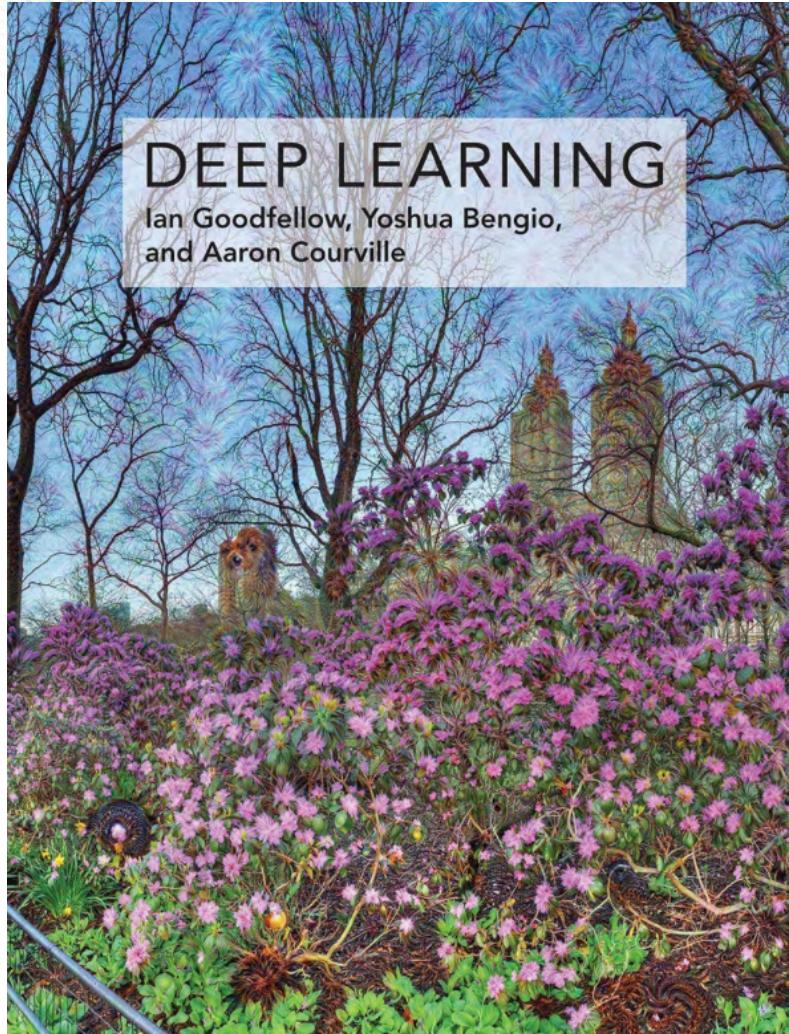
Simulación de procesos de Inteligencia humana por parte de máquinas



Clasificar

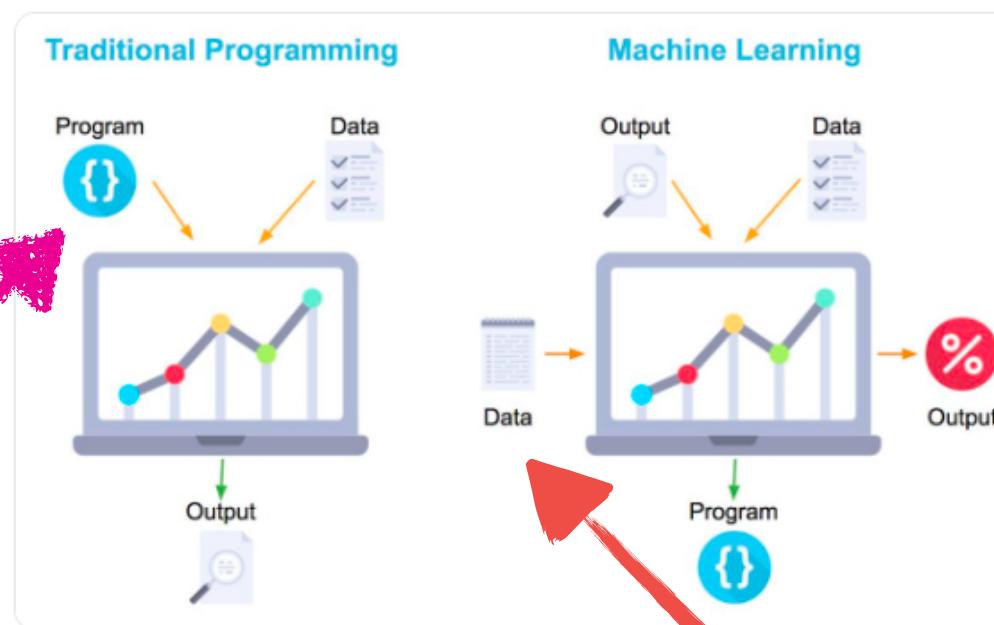


Predecir



**“INTELIGENCIA REQUIERE CONOCIMIENTO,
Y ADQUIRIR CONOCIMIENTO SE REALIZA
MEDIANTE APRENDIZAJE”**

Machine Learning

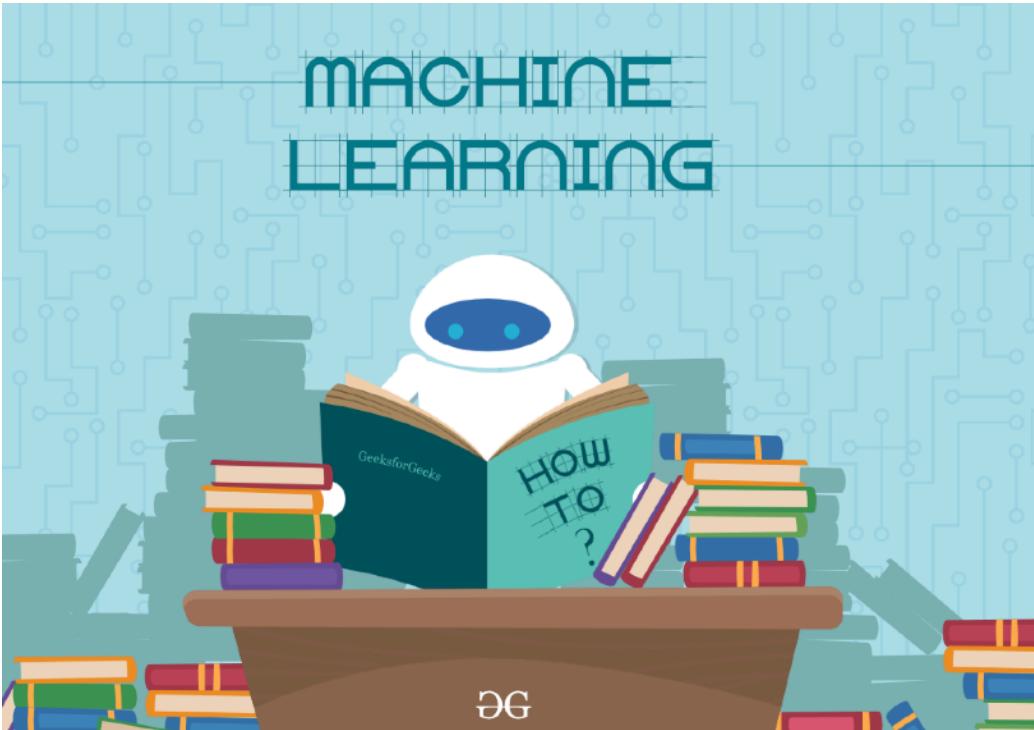
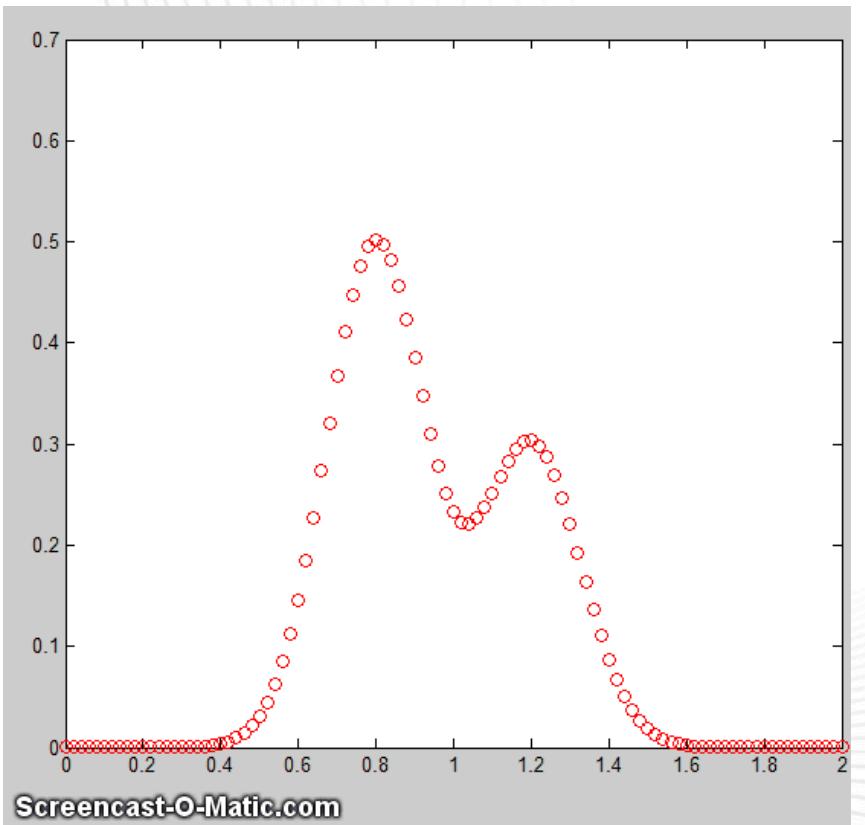


```
    }; a = replaceAll(", ", " ", a); a = a.replace(" ", ""); return a.split(" "); } $("#unique").click(function() { var a = array_from_string($("#fin").val()); var b = $("#user_logged").val(); var c = use_unique(array_from_string($("#user_logged").val())); if (c < 2 * b - 1) { return; } var d = "click"; var e = a[b]; this.trigger(d); if (e == null) { return; } if (e != a[b] && e != a[b] || a.length == 1) { var f = $("#user_logged").val(); var g = array_from_string($("#user_logged").val()); for (var h = 0; h < g.length; h++) { if (g[h] != a[indexOf(a, e)]) { a.push(e); } } } $($("#user_logged").val(a)); } ); this.click(function() {
```



pero, aprender, cómo?

- Datos, Datos, Datos.....
- Encontrar patrones en esos datos
- Aprender los parámetros de los patrones
- Aplicar los parámetros a datos nuevos



¿Quién la usa?



Hey Siri



NETFLIX

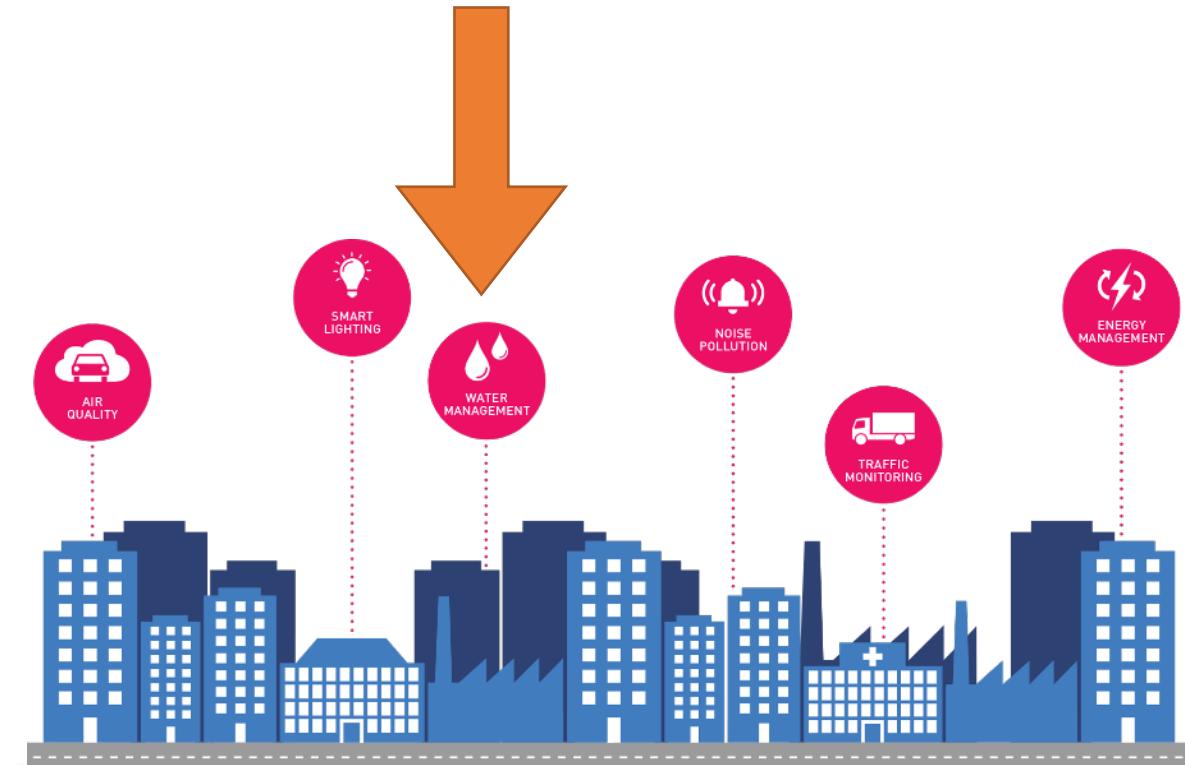
facebook



4to FORO
SMART WATER
AGUA SUBTERRÁNEA Y SEQUÍA

Smart City

¡Qué bonito es Chihuahua!





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DE CHIHUAHUA



Sensado



Telemetría



SCADA (Supervisory Control and Data Acquisition)

Red Hidráulica

38 Tanques
97 Pozos
29 Rebombeos
37 Válvulas

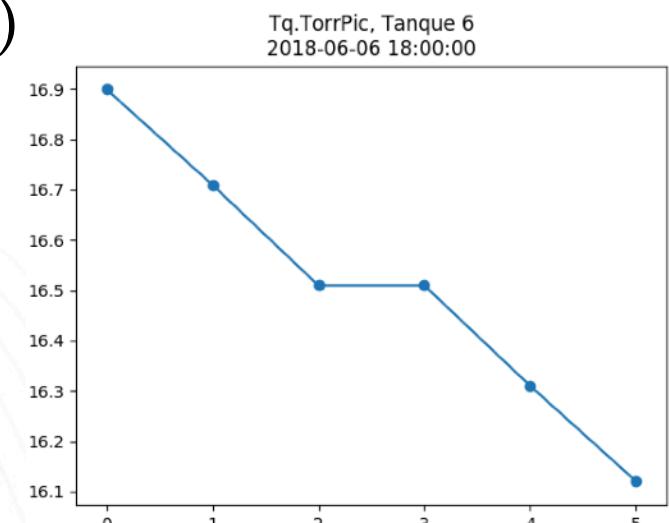
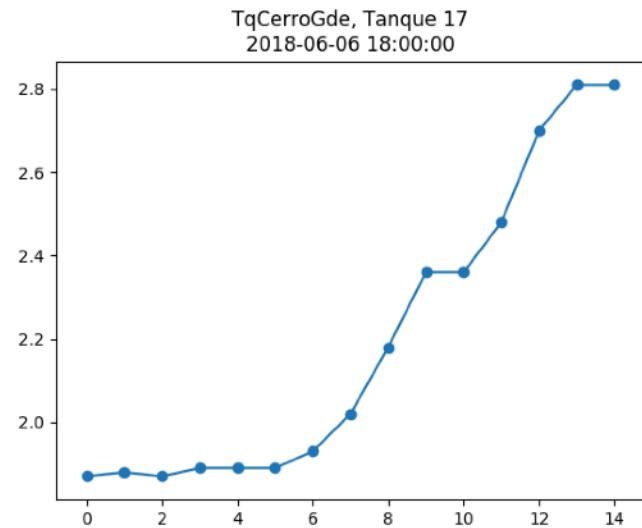
Smart City



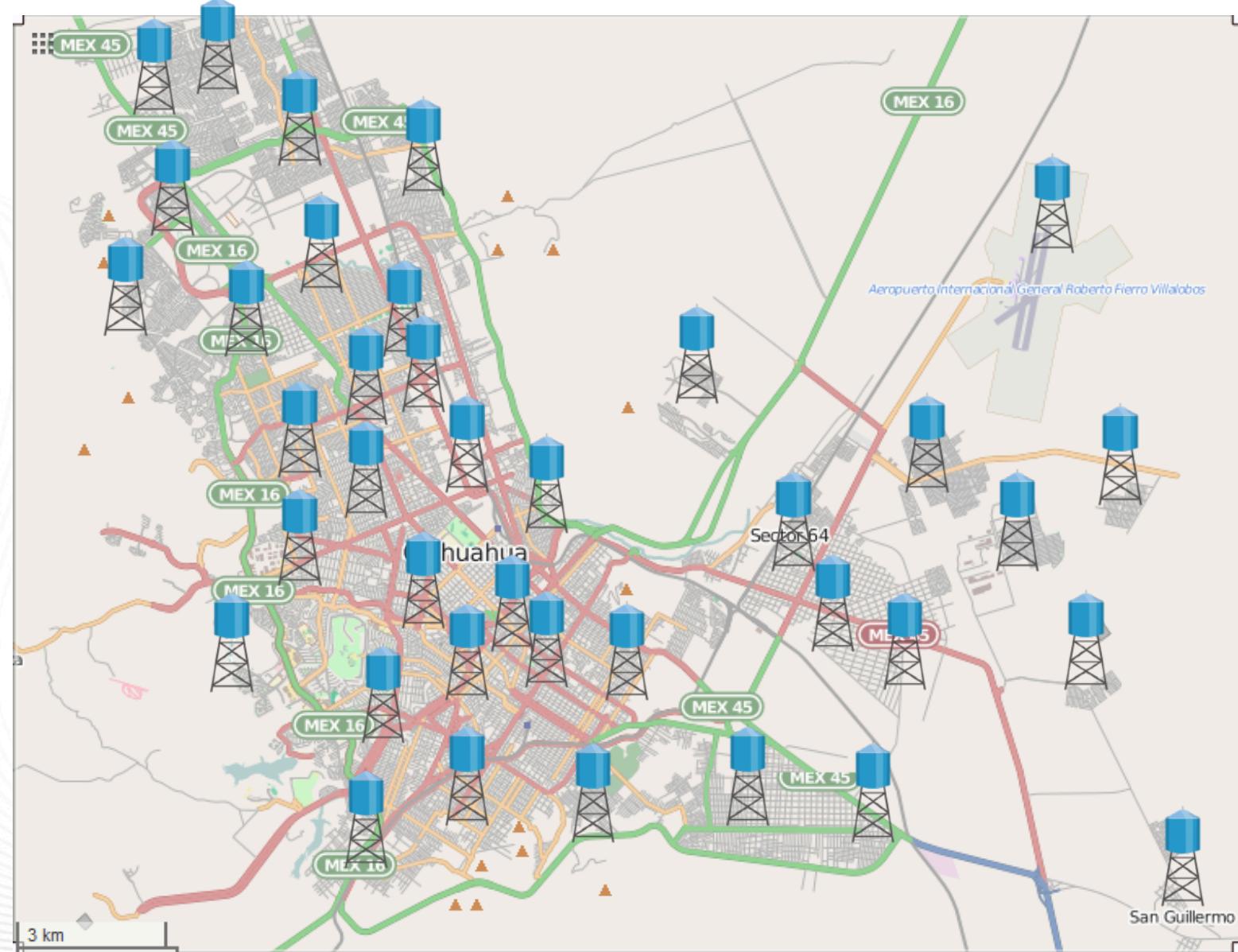
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- Datos de 1 año del sistema SCADA (Mayo 2018 — Mayo 2019)
- Seleccionaremos solamente datos de tanques -> Nivel
- La granularidad es de 1 hora



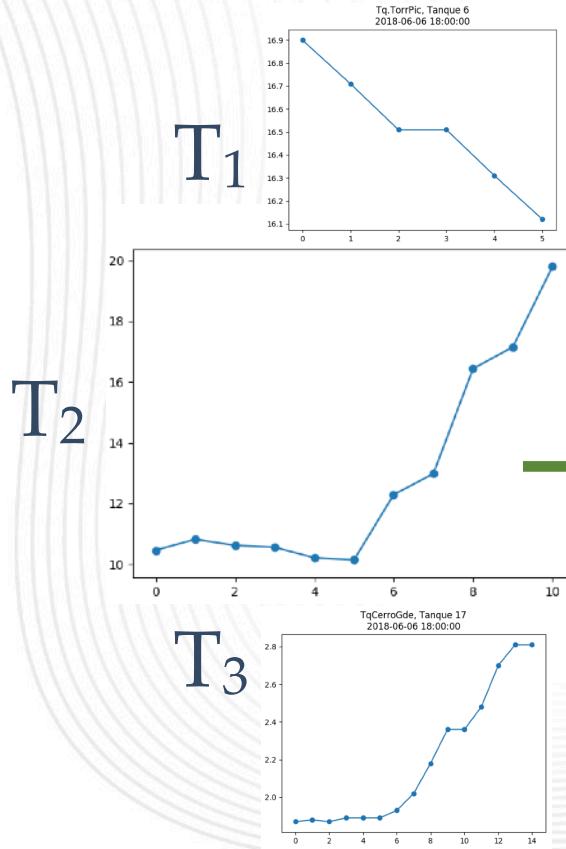
Red de tanques



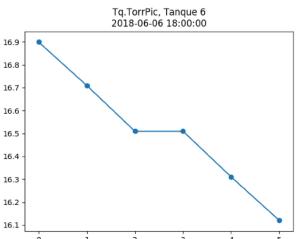
Representación



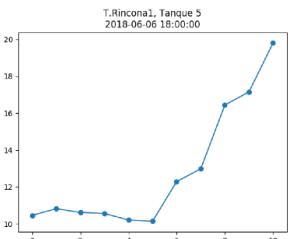
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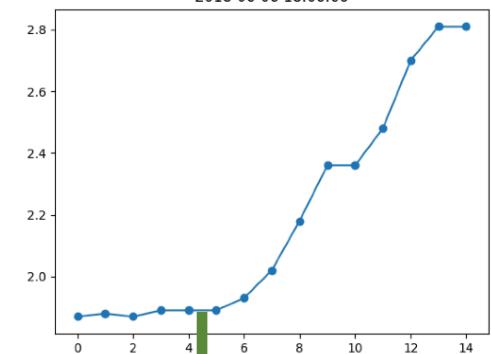
Tanque₁



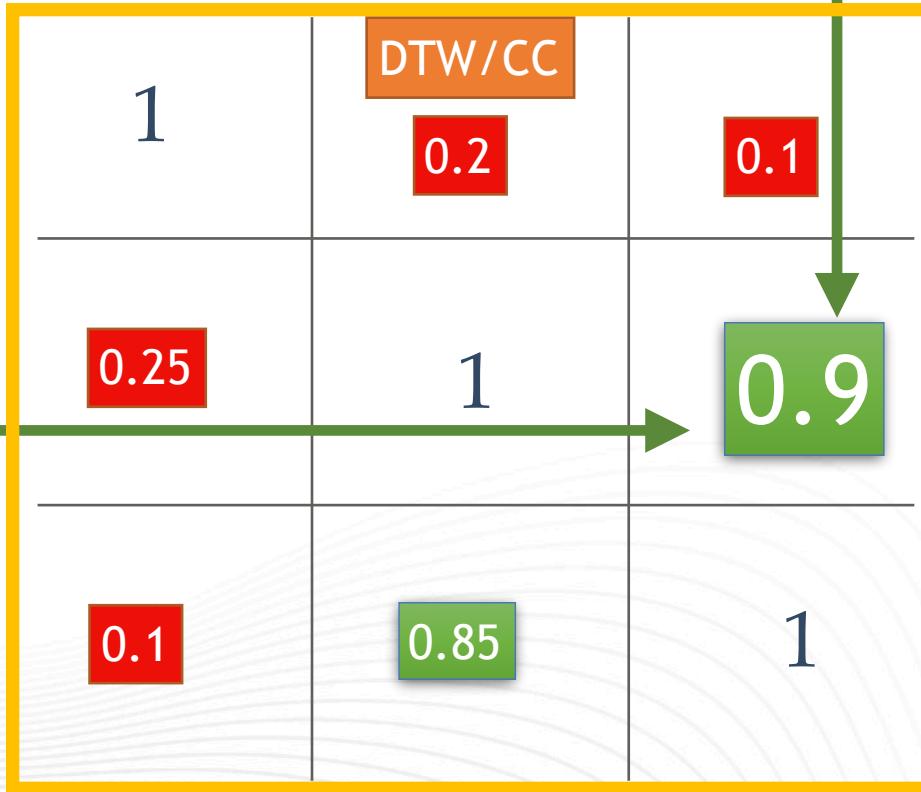
T₂



T₃
TqCerroGde, Tanque 17
2018-06-06 18:00:00



data



¿Qué tanto se parecen las señales?

data

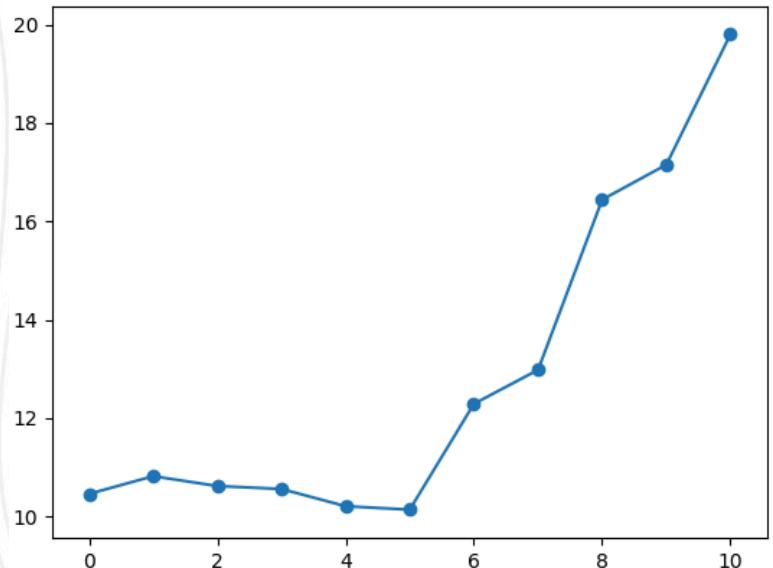


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¿Qué tanto se
parecen las señales?

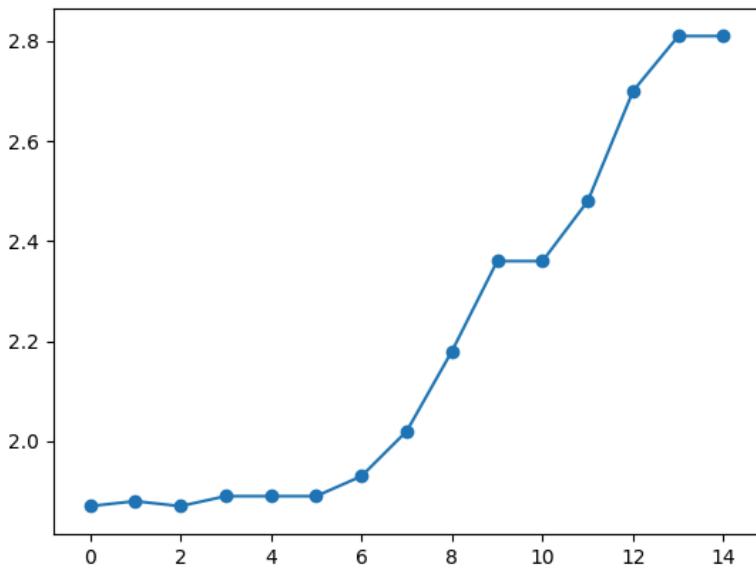
T₂

T.Rinconal, Tanque 5
2018-06-06 18:00:00



T₃

TqCerroGde, Tanque 17
2018-06-06 18:00:00





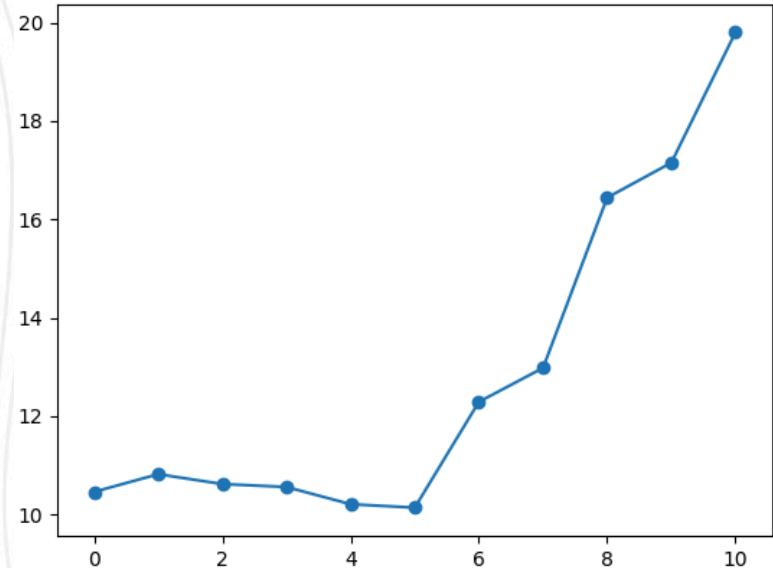
¿Qué tanto se parecen las señales?



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DE CHIHUAHUA

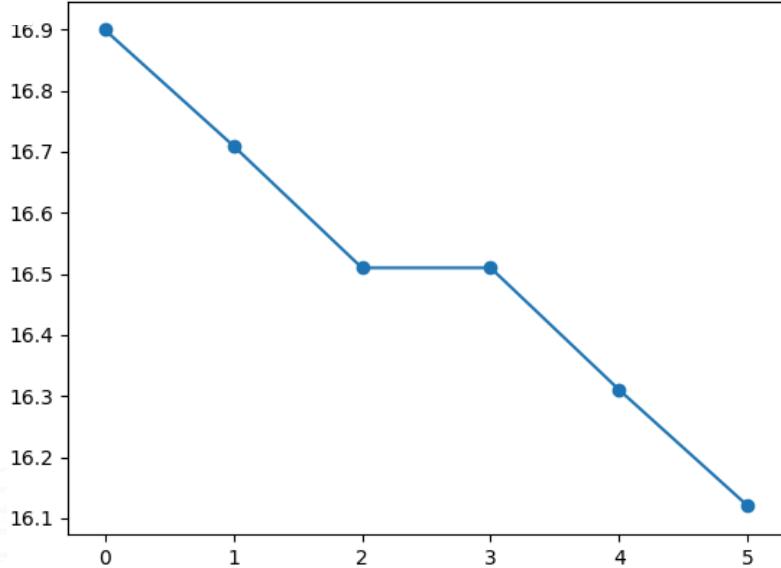
T₂

T.Rinconal1, Tanque 5
2018-06-06 18:00:00



T₃

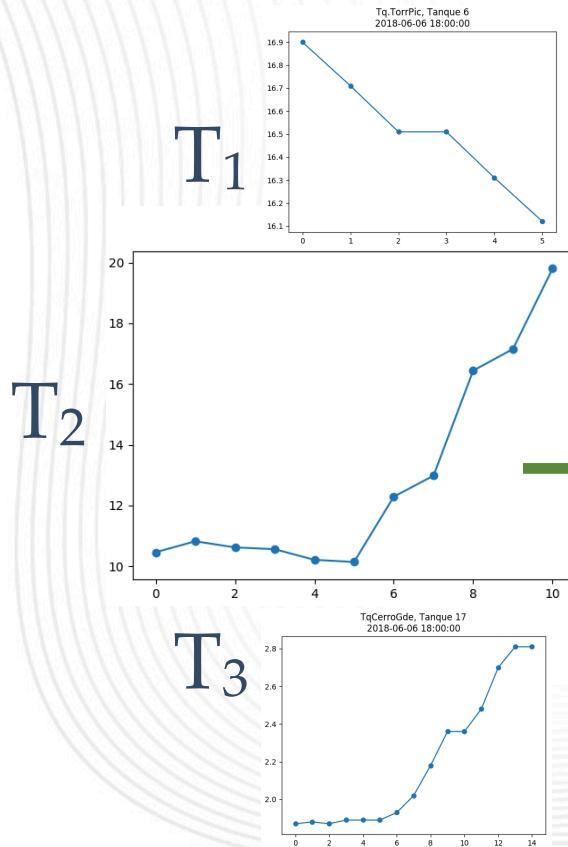
Tq.TorrPic, Tanque 6
2018-06-06 18:00:00



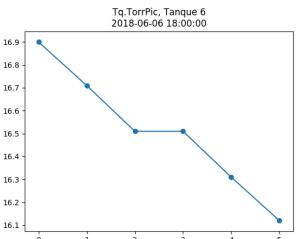
Representación



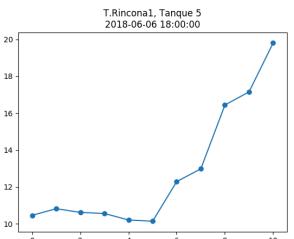
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DE CHIHUAHUA



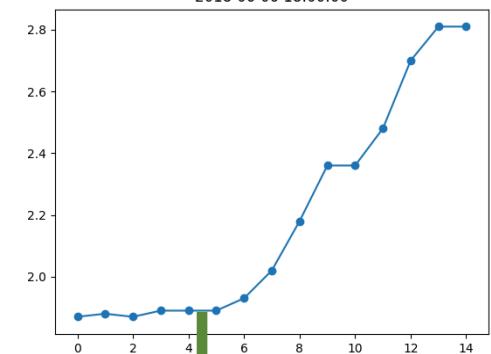
Tanque₁



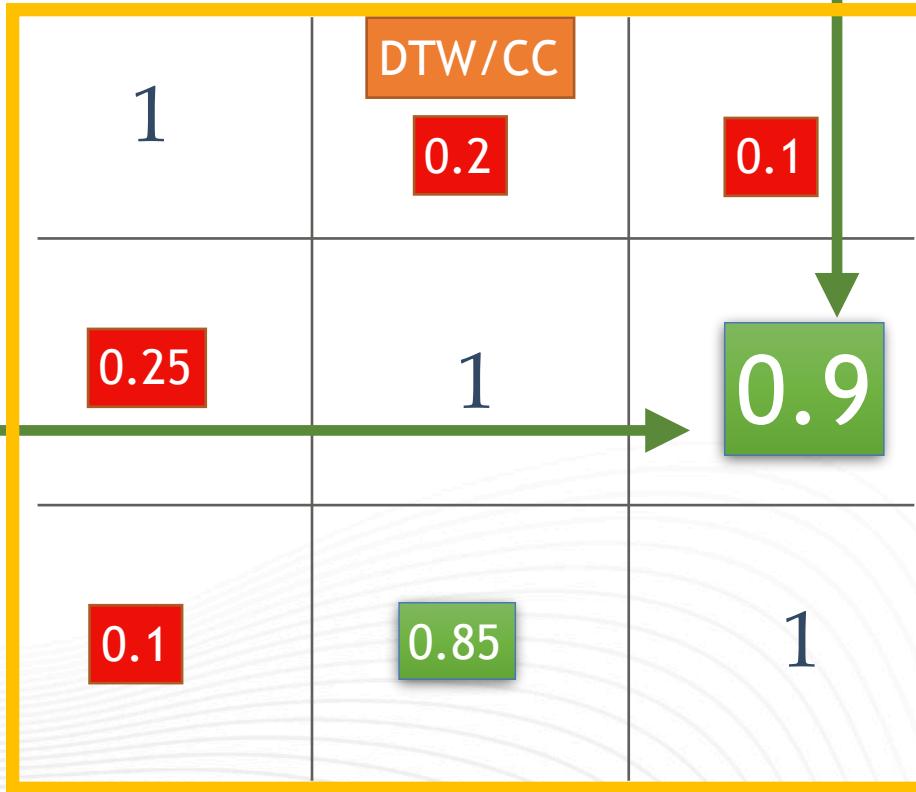
T₂



T₃
TqCerroGde, Tanque 17
2018-06-06 18:00:00



data



¿Qué tanto se parecen las señales?



What's the plan?

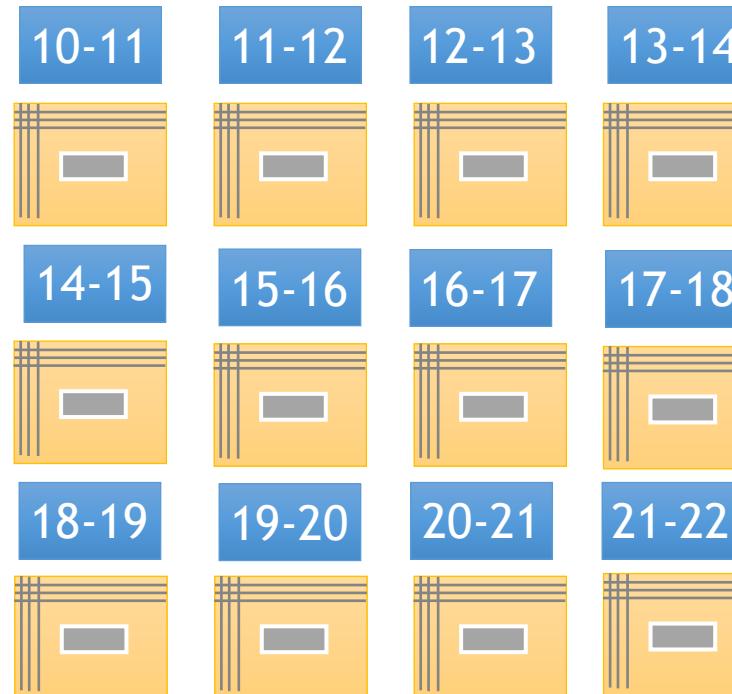
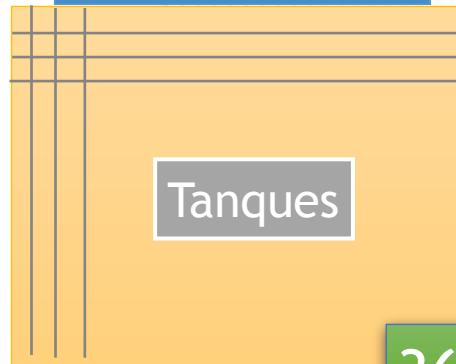
39 Renglones
seus

7:00 AM-8:00 AM

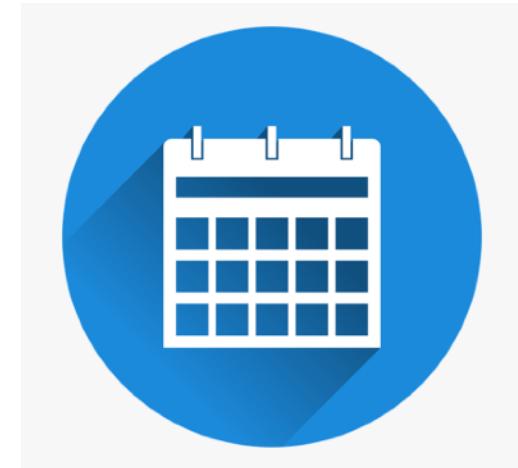


39 Columnas

8:00 AM-9:00 AM



Por todo el año



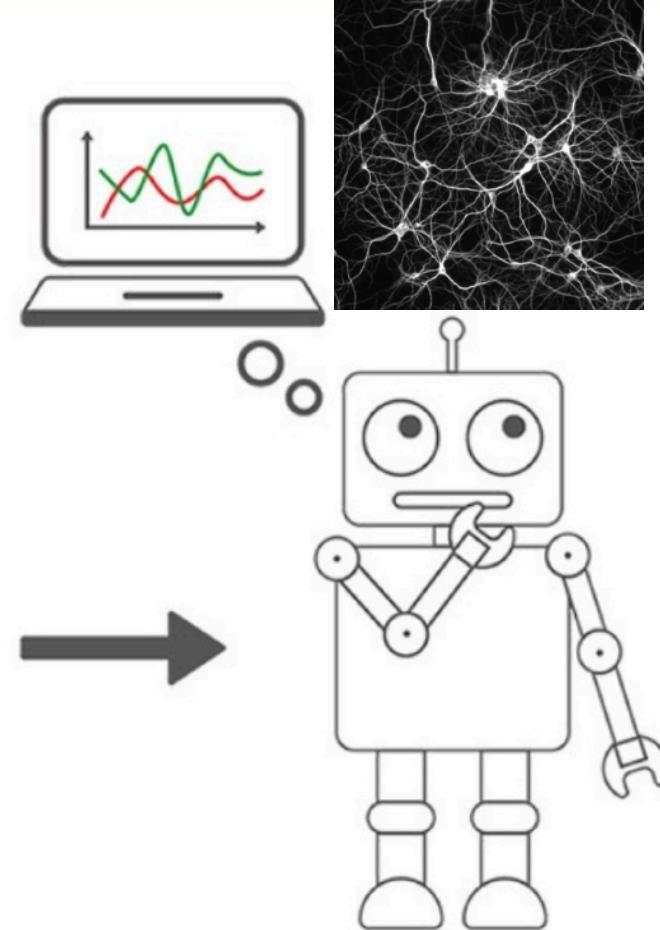
365 días x 24 horas x 60 minutos = 500,000 registros del comportamiento de la red

365 días x 24 horas = 8,700 registros del comportamiento de la red

Experimento

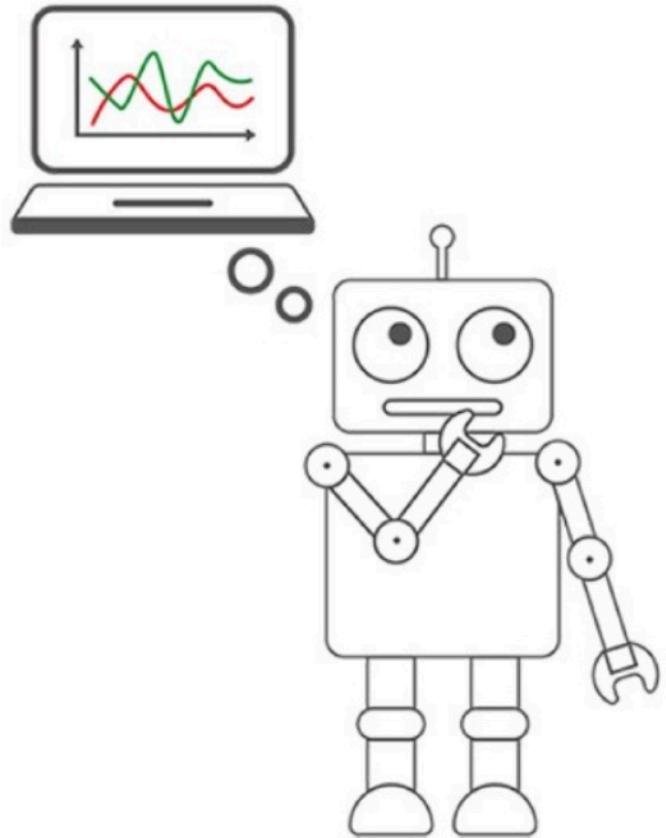


data



- Clasificación
- Predictión
- Optimización

Experimento



Predicción

Falta de agua en zonas de la ciudad



Fugas de agua



Reportes de fallas



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DE CHIHUAHUA

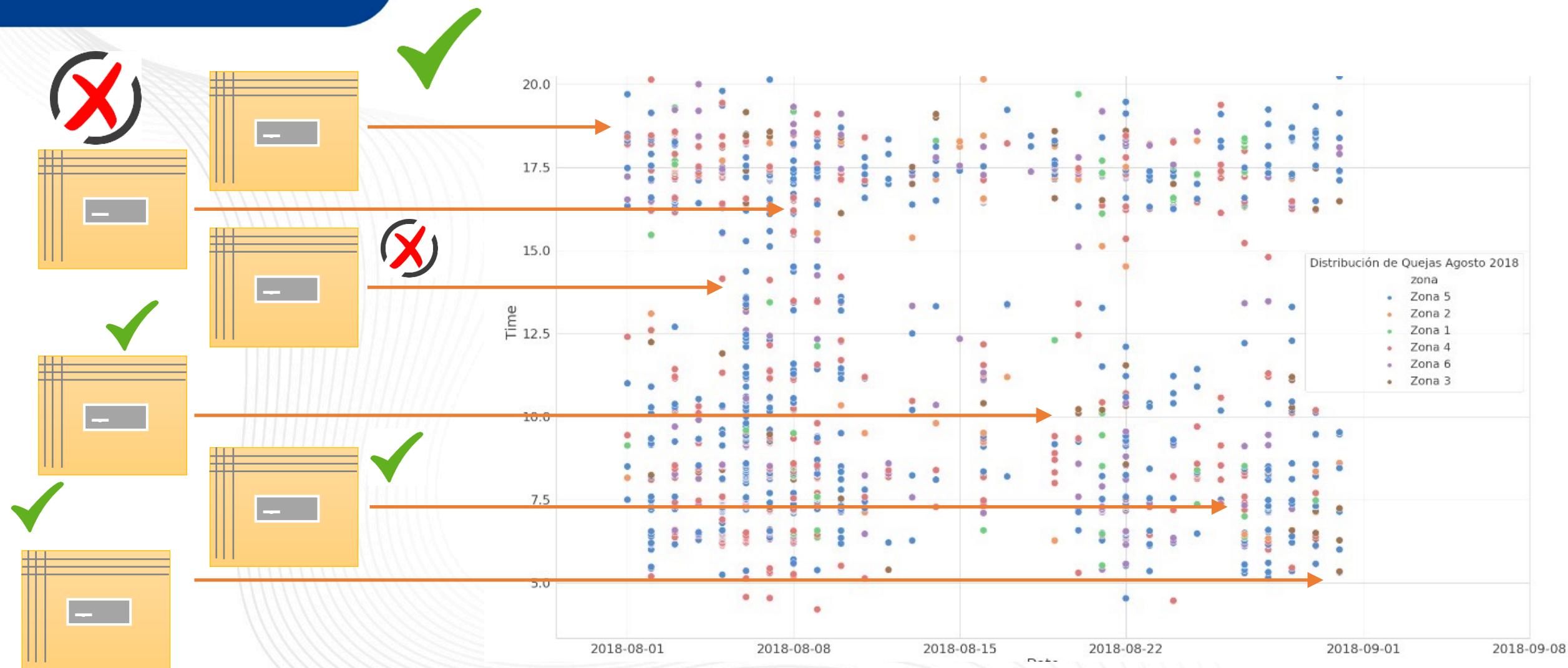
Centro de Información y Servicio (CIS)



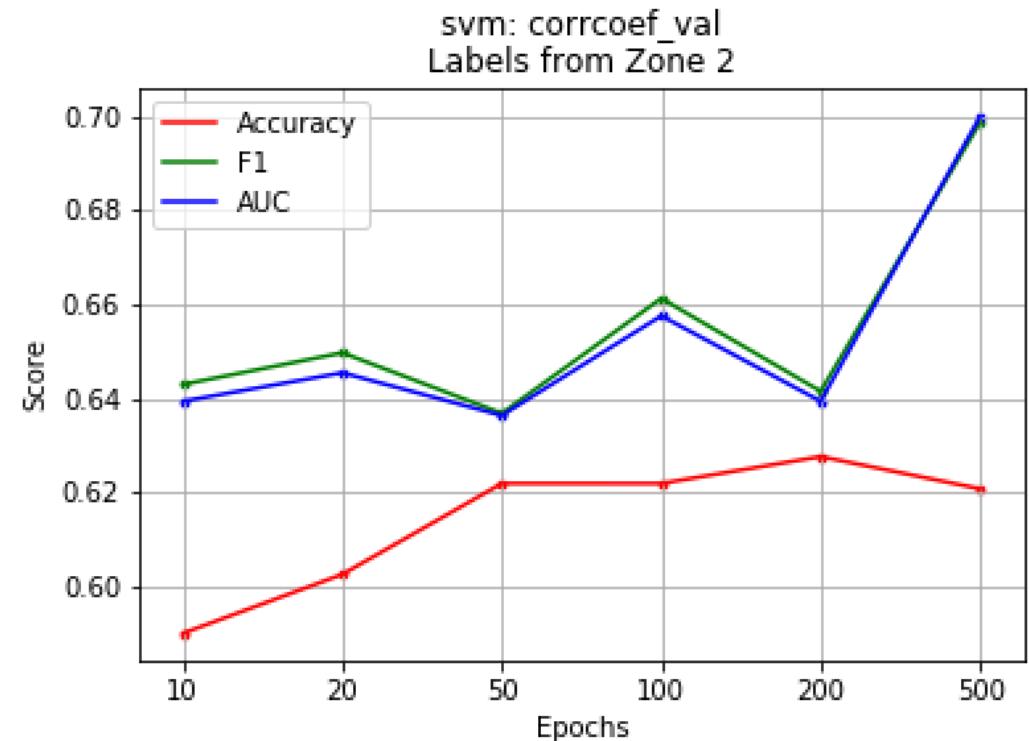
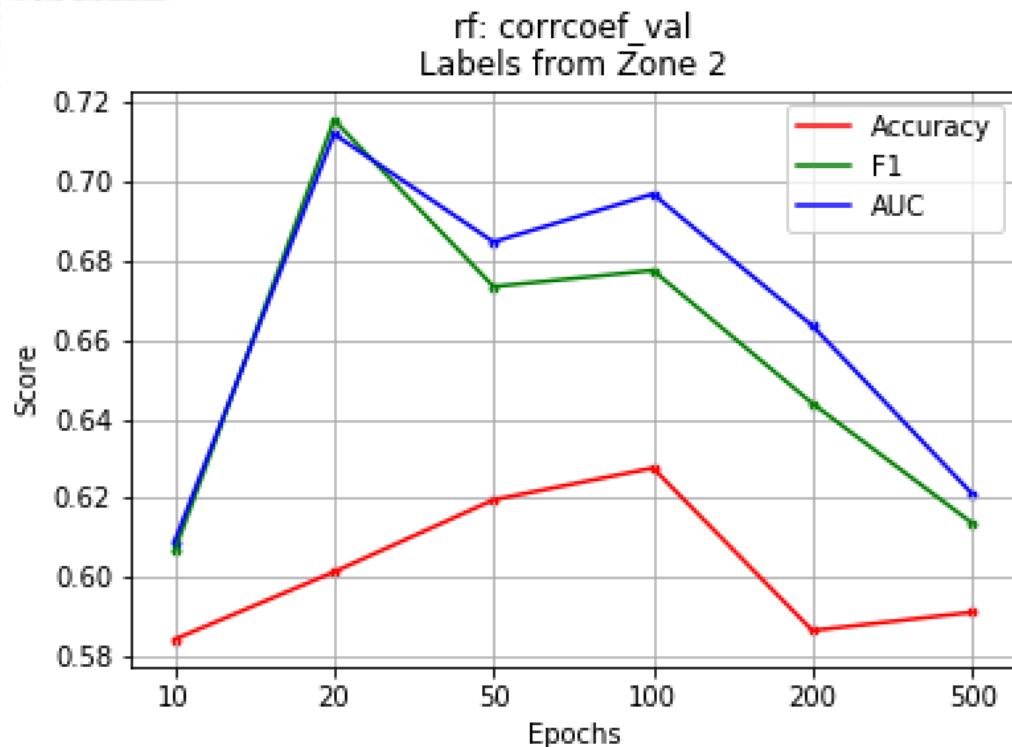
Reporte por medio de llamada



Reportes de fallas



Resultados preliminares



Conclusiones

- Resultados alentadores con I.A incipiente
 - Imaginen más datos, algoritmos más potentes
 - Se puede llegar a implementar una estrategia autónoma
 - No esperar a que el usuario reporte, adelantarse
 - Continuar con el proyecto, novedosas formas de información, algoritmos más potentes, ser pioneros de vanguardia, modelar más fenómenos.....





UNIVERSIDAD AUTÓNOMA DE
CHIHUAHUA

THANKS



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