B.A.R.C.O.:

Bio-Augmented Responsive Communication Optics

16.18 - Instrumentación Biomédica II

Grupo 3: Mia Arrigoni, Mila Langone, Lucía Simoncelli

CONTENIDOS

01
INTRODUCCIÓN

Estado del arte.
Propuesta de valor.

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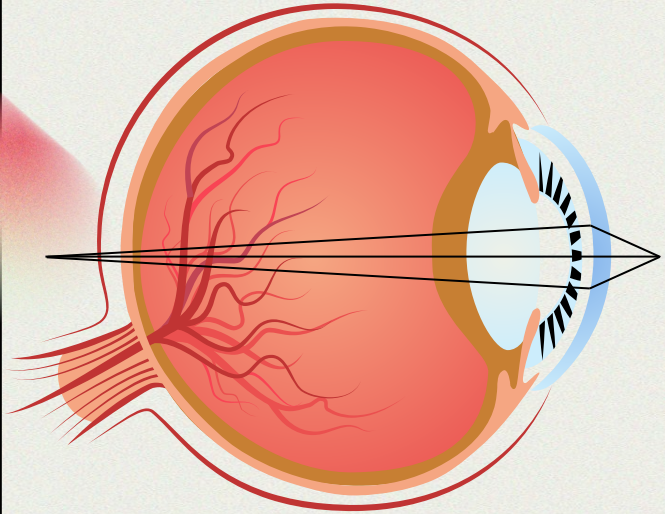
Sensor. Módulo Bluetooth.
Arduino. Diseño 3D.

03
APP

Especificaciones técnicas.
Features.

04
CONCLUSIÓN

Objetivos logrados.
Mejoras a futuro.



01

INTRODUCCIÓN

Justificación del proyecto.
Descripción y uso previsto.

CAA

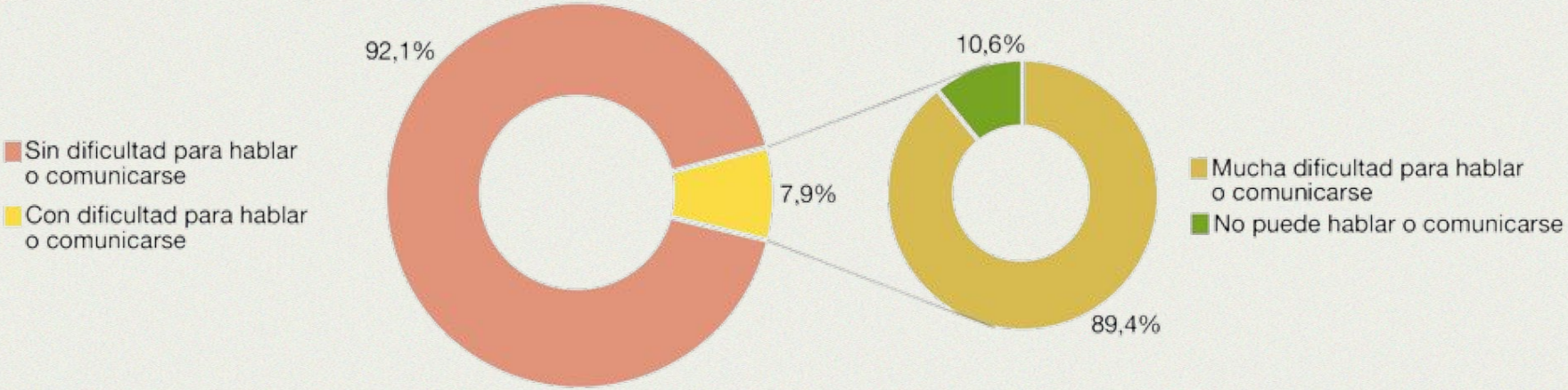
Comunicación Aumentativa y Alternativa

Sin ayuda:
Expresiones faciales.
Lenguaje corporal.
Gestos.
Lengua de signos.

Con ayuda:
Tableros de símbolos.
Tarjetas de elección múltiple.
Teclados.
SAAC en dispositivos móviles.

En Argentina

Población con dificultad del habla y la comunicación de 6 años y más, por grado de dificultad.



Fuente: INDEC. Estudio Nacional sobre el Perfil de las Personas con Discapacidad 2018.

GRUPOS AFECTADOS

MOTOR

Personas con discapacidad motora por parálisis cerebral, traumatismos craneoencefálicos o patologías neuromusculares progresivas

COGNITIVO

Personas con discapacidad intelectual, cognitiva o psíquica, como trastornos de desarrollo y trastorno espectro autista (TEA)

SENSORIAL

Personas con discapacidad sensorial, como sordera o sordomudez.

PROPUESTA DE VALOR

01 ACCESIBILIDAD

- Fundación GECENYM
- Tobii
- Irisbond

02 COSTO

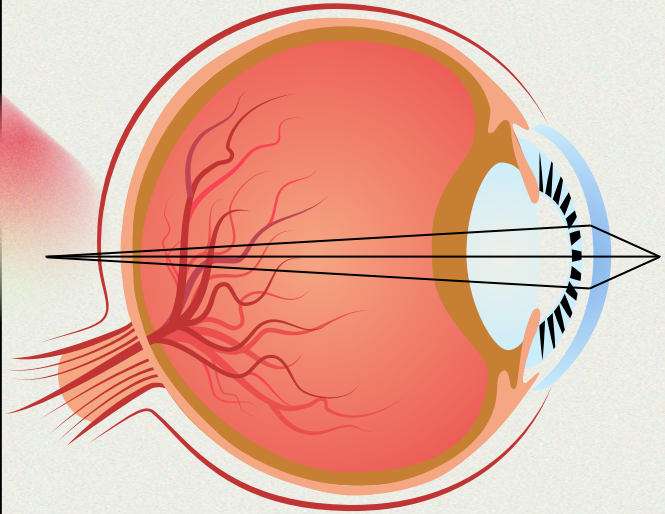
- Costo de fabricación prototipo 37 USD

03 SUSTENTABILIDAD

- Impresión 3D con PLA reciclado

04 PORTABILIDAD

- Autonomía
- Autoestima
- QALYs

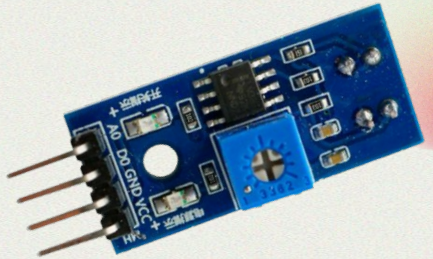


02

HARDWARE

Sensor IR, módulo Bluetooth, Arduino y diseño 3D.

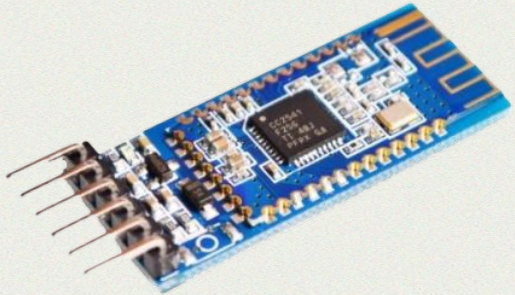
SENSOR IR - TCRT5000



Para detectar los *blinks* del usuario.

Sensibilidad configurable
ajustada por potenciómetro.

MÓDULO BT - HC05



Para transmitir los datos a la APP.

Baud rate de 9600.
Transmisión uno a uno de los datos.

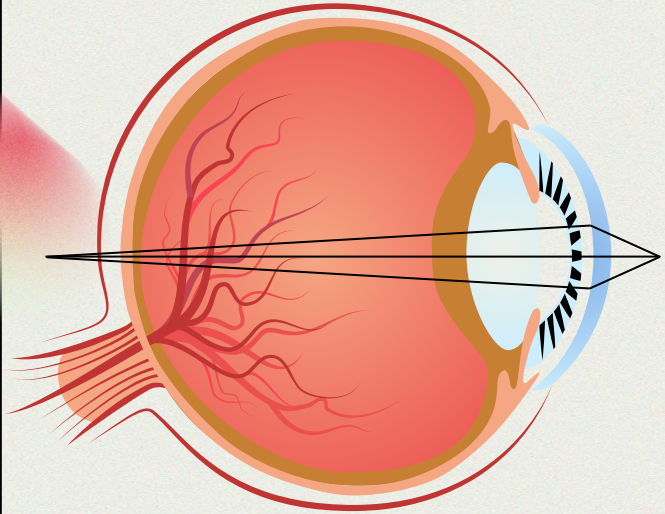
PROCESADOR- ATMEGA 2560

Para integrar sensores y módulos.

DISEÑO 3D

Para incorporar el sensor IR.

Software 3D Builder con diseño personalizado.



03

APP

Especificaciones técnicas.
Features.

ENTORNO DE DESARROLLO

ANDROID STUDIO

El **90%** de los argentinos tiene un smartphone que funciona con **Android**.*
Más accesible.

JAVA

Permite gestionar la memoria utilizada de manera integrada.

*Mercado celular argentino 2023, Carrier y Asociados

BLUETOOTH

TRANSMISIÓN LENTES - APP

- Señal **digital** → binaria → requiere **instantaneidad**.
- Se envían los datos uno a uno.

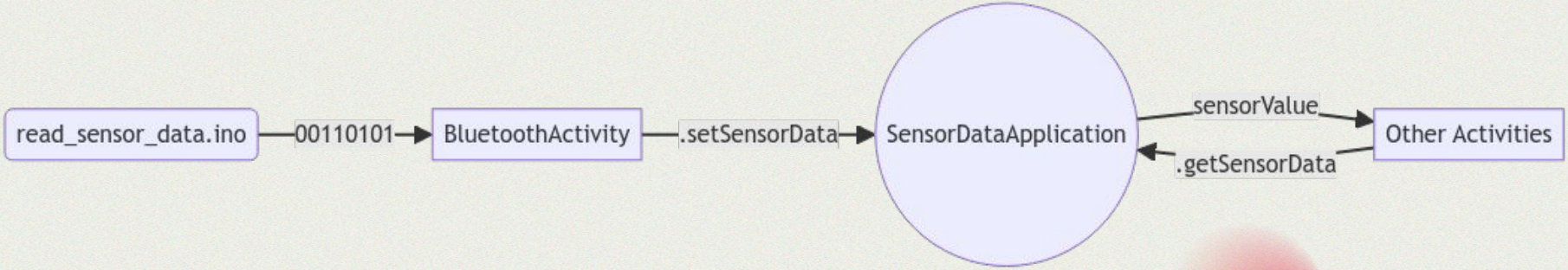


Fig.: Diagrama de flujo de transmisión de datos por Bluetooth.

SINCRONIZACIÓN

FACTORES

- **Maximizar caracteres por segundo**
- **Parpadeo instantáneo [150-200ms]**
- **Parpadeo voluntario [250-350ms]**
- **Manejo de memoria**

SINCRONIZACIÓN

DECISIONES

- Caracteres por segundo
  - **Frecuencia de rotación de los botones**
- Parpadeo instantáneo [150 - 200ms]
  - **Cota inferior determinada por Teorema de Nyquist**
- Parpadeo voluntario [250 - 350ms]
  - ***Target input***
- Manejo de memoria
  - **Cota superior determinada por hilos (50ms)**

FEATURES DE LA APP

1. UI enfocada en accesibilidad
2. Múltiples teclados
3. Configuración personalizable
4. Conexión Bluetooth

1.1. DISPOSICIÓN DE LOS BOTONES

01 CARROUSEL

Un único botón que rota.

no resulta óptimo para maximizar la *user-experience a la hora de introducir texto*

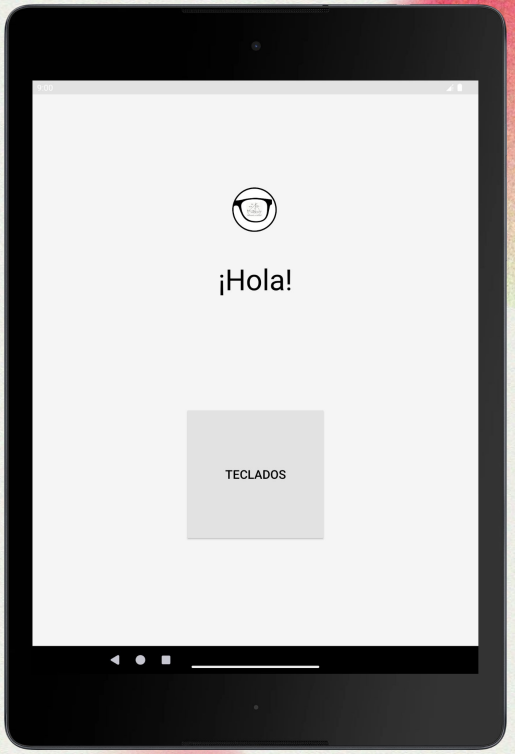
02 SELECTOR

Un selector que recorre los distintos botones presentes en pantalla.

permite la selección de forma más predecible y accesible para los usuarios.

¡Hola!
BLUETOOTH

¡Hola!
CONFIGURACIÓN


¡Hola!
TECLADOS

ABCDEFGH
IJKLM
NOPQRSTU
VWXYZ

ABCDEF
GHIJKLM

1.2. TECLADOS

PRESENTACIÓN DE LOS BOTONES

- **De a 5 letras (5-(3-2)-1):**
  - **F = 1Hz** → TT = 3 + 4 + 3 + 0 = **10s**
- **De a 3 letras (3-(2-1)-1):**
  - **F = 1Hz** → TT = 3 + 5 + 4 + 0 = **12s**
- **Individual:**
  - **F = 1Hz** → TT = 8 + 15 + 12 + 0 = **35s**
- **Binaria:**
  - **F = 1Hz** → TT = 2 + 2 + 3 + 0 = **7s**

1.3. PARPADEO LARGO

LONG PRESS

Habilita un nuevo set de botones

BORRAR ÚLTIMO

BORRAR TODO

VOLVER ATRÁS

2. TIPOS DE TECLADO

01 ALFABÉTICO

Letras de la A a la Z.

02 NUMÉRICO

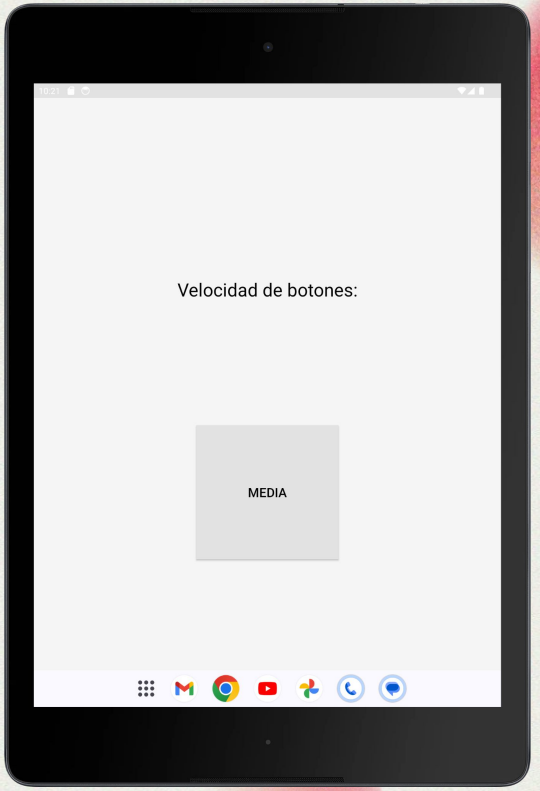
Números del 0 al 9.

03 PALABRAS ARMADAS

‘HOLA’, ‘CHAU’, ‘SI’, ‘NO’.

3. CONFIGURACIÓN PARA EL USUARIO

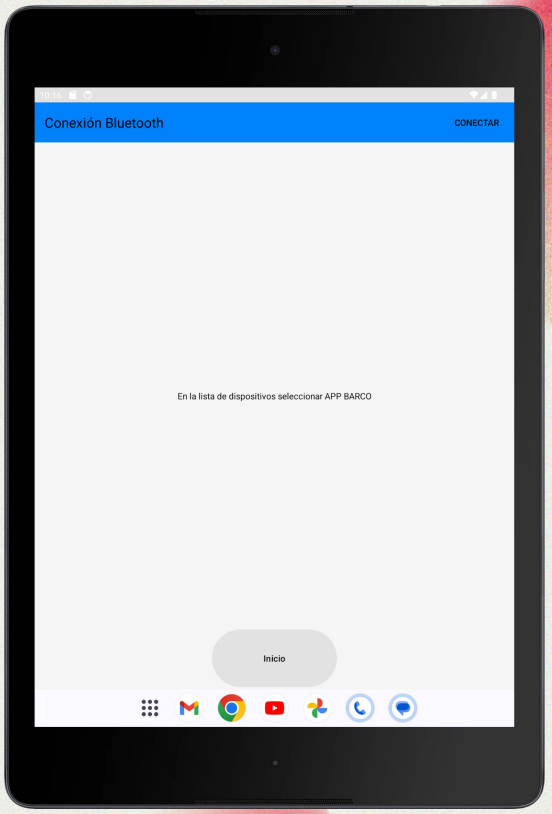
- **Frecuencia de rotación** del selector y botones:
  - Baja (0.33Hz)
  - Media (0.5Hz)
  - Alta (1Hz)



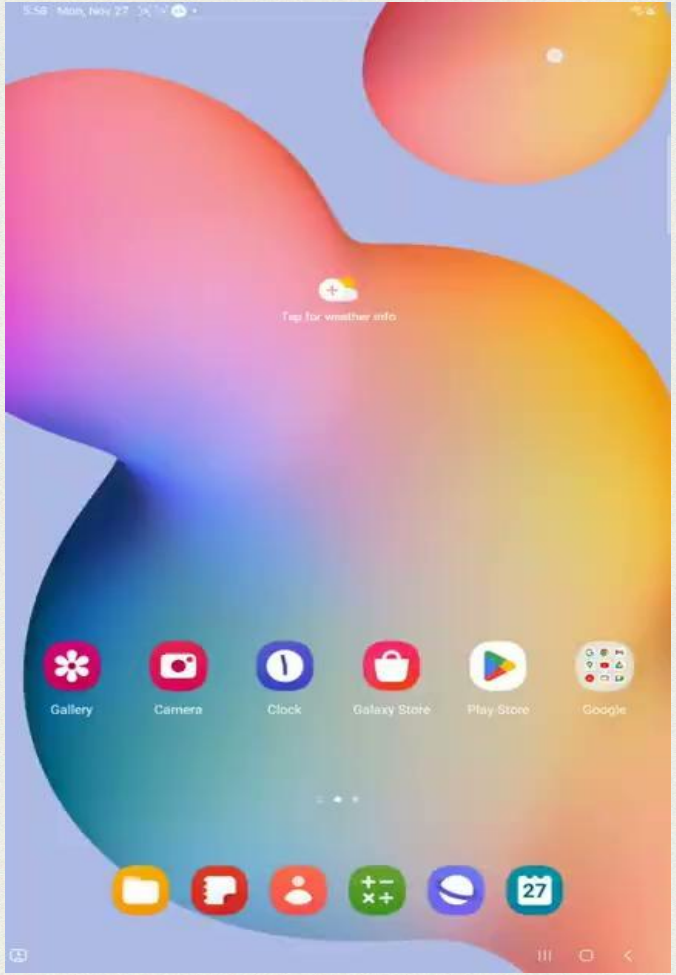
4. CONEXIÓN BLUETOOTH

LENTES- APP

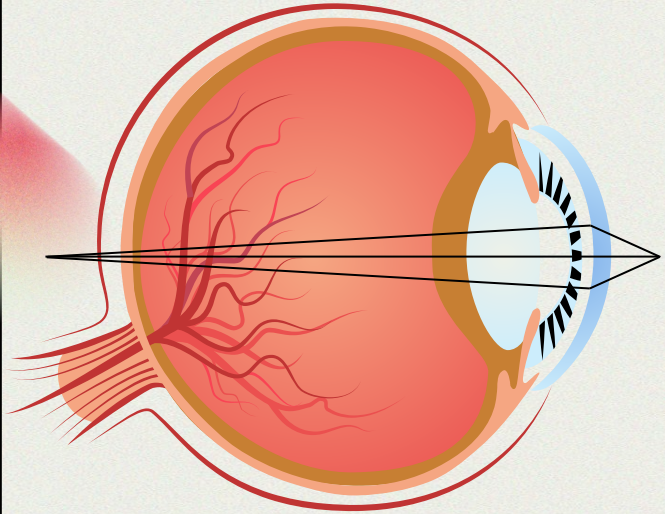
- Escenario inicial → **requiere asistencia** para llevar a cabo la conexión Bluetooth.
- En la APP se accede a la lista de dispositivos disponibles → se debe seleccionar ***APP B.A.R.C.O.***
- Dispositivo ***wearable***



APP DEMO


Tap for weather info
Gallery
Camera
Clock
Galaxy Store
Play Store
Google
27

APP DEMO



04

CONCLUSIÓN

Objetivos logrados.
Mejoras a futuro.

OBJETIVOS LOGRADOS

- ★ Transmisión **Bluetooth** efectiva de señal digital.
- ★ Detección correcta de ***blinks***.
- ★ Desarrollo de **prototipo** funcional.
- ★ Diseño **portable** y **optimizado** para comodidad del usuario.
- ★ Desarrollo de **aplicación** orientada a la **accesibilidad**.

MEJORAS A FUTURO

01

PRECISIÓN

Mejorar la velocidad de respuesta de la app

02

BLUETOOTH

Integración de la APP con el entorno de accesibilidad de los dispositivos móviles.

03

TECLADO PREDICTIVO

Incorporación de un teclado predictivo.

MEJORAS A FUTURO

04

NUEVOS TECLADOS

Incorporación de nuevos teclados personalizables.

05

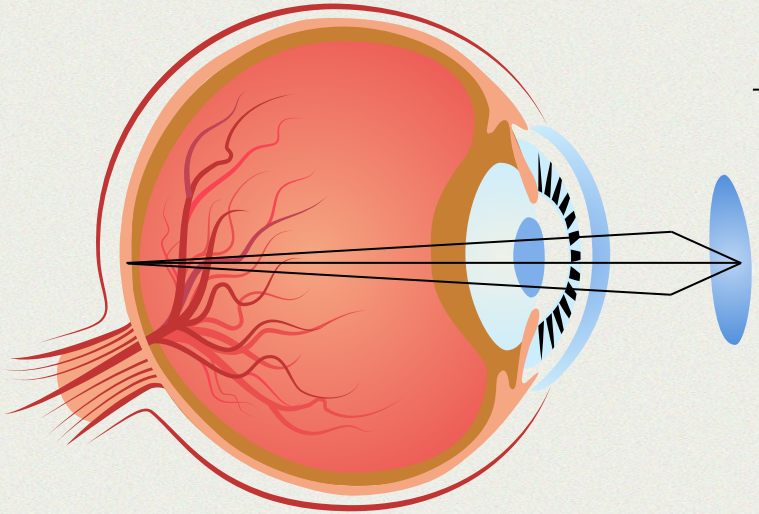
PICTOGRAMAS

Incorporación de pictogramas.

06

TEXT TO SPEECH

Incorporación de modo lectura del texto.



¡GRACIAS!

¿PREGUNTAS?

ABOUT THE DISEASE

MARS

Mars is a very cold planet. It's full of iron oxide dust, which gives the planet its reddish cast

EARTH

Earth is the third planet from the Sun and the only one that harbors life in the Solar System

VENUS

Venus has a beautiful name and is the second planet from the Sun. It has a highly toxic atmosphere

ABOUT THE DISEASE

PRESBYOPIA

INCIPIENT

Venus is the second planet from the Sun

FUNCTIONAL

Despite being red, Mars is actually very cold

ABSOLUTE

Jupiter is the biggest planet of them all

PREMATURE

Earth is the planet on which we all live

NOCTURNAL

Mercury is the smallest planet of them all

PATHOLOGY

EARTH

Earth is the third planet from the Sun and the only one that harbors life in the Solar System

VENUS

Venus has a beautiful name and is the second planet from the Sun. It’s terribly hot

SATURN

Saturn is a gas giant and has several rings. It's composed mostly of hydrogen and helium

NEPTUNE

Neptune is the farthest planet from the Sun. It's also the fourth-largest one of them all

CONCEPTS AND TYPOLOGY

INCIPIENT

Earth is the third planet from the Sun and the only one that harbors life in the Solar System

FUNCTIONAL

Venus has a beautiful name and is the second planet from the Sun. It’s terribly hot

ABSOLUTE

Saturn is a gas giant and has several rings. It's composed mostly of hydrogen and helium

PREMATURE

Neptune is the farthest planet from the Sun. It's also the fourth-largest one of them all

NOCTURNAL

Saturn is a gas giant and has several rings. It's composed mostly of hydrogen and helium

SYMPTOMS OF THE DISEASE

01 HEADACHES

Mercury is the smallest planet in the entire Solar System

02 EYESTRAIN

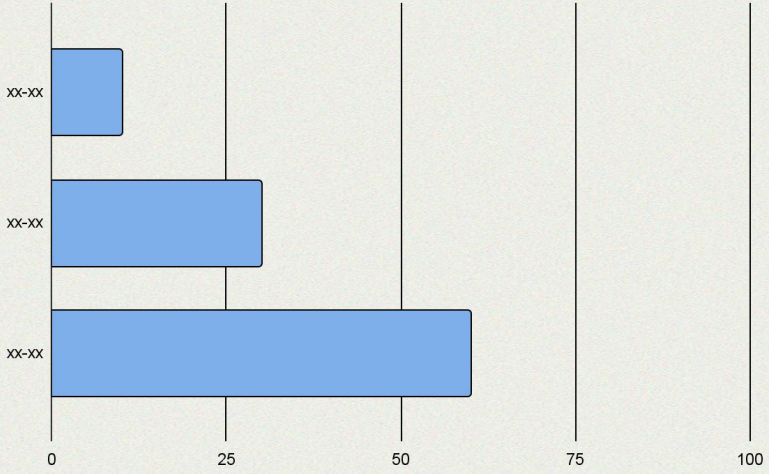
Venus is the second planet from the Sun and has a nice name

03 BLURRED VISION

Despite being red, Mars is actually a cold planet

RISK FACTORS

AGES



50% Mercury is the closest planet to the Sun

20% Venus is the second planet from the Sun

30% Earth is the only planet known to harbor life

DRUGS

- Alcohol
- Antidepressants
- Anxiety drugs
- Antihistamines
- Antipsychotics
- Diuretics

Follow the link in the graph to modify its data and then paste the new one here. **For more info, click here**

150,000

Big numbers catch your audience’s attention

KEY NUMBERS

MERCURY

50,000

Mercury is the closest planet to the Sun

VENUS

5,000

Venus is the second planet from the Sun

MARS

20,000

Despite being red, Mars is a cold planet

JUPITER

3,000

Jupiter is a gas giant and a very big planet

A PICTURE IS WORTH A THOUSAND WORDS

“This is a quote, words full of wisdom that someone important said and can make the reader get inspired.”

—SOMEONE FAMOUS

DIAGNOSIS

VENUS

Venus has a beautiful name and is the second planet from the Sun

MARS

Despite being red, Mars is actually a cold place. It's full of iron oxide dust

SATURN

Saturn is a gas giant and has several rings. It's composed of hydrogen

MERCURY

Mercury is the closest planet to the Sun and the smallest one of them all

JUPITER

Jupiter is a gas giant and the biggest planet in the Solar System

NEPTUNE

Neptune is the fourth-largest planet in the Solar System

RECOMMENDATIONS

WHAT TO DO

- You can describe what the patient should do here
- You can describe what the patient should do here
- You can describe what the patient should do here
- You can describe what the patient should do here
- You can describe what the patient should do here

WHAT NOT TO DO

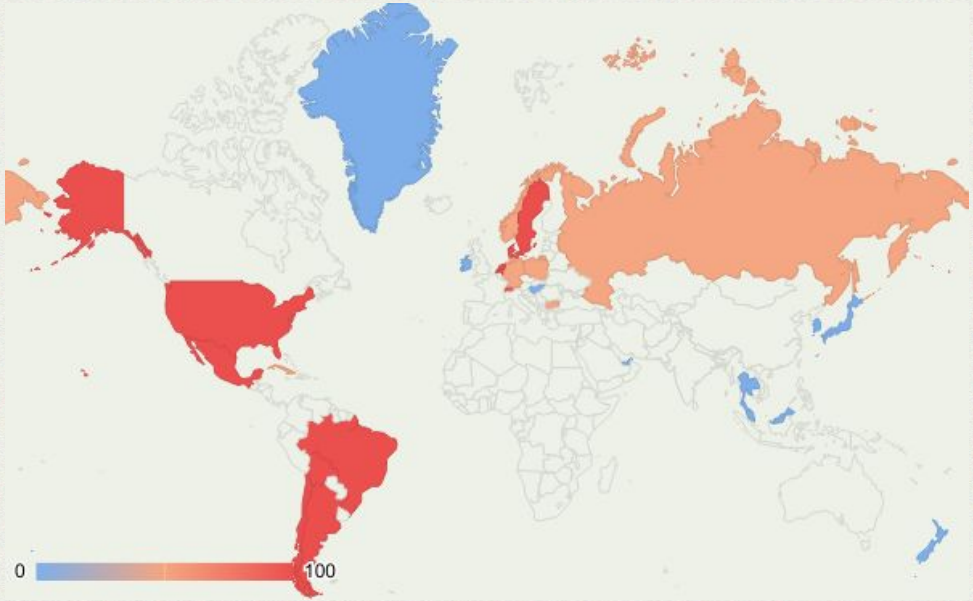
- You can describe what the patient shouldn’t do here
- You can describe what the patient shouldn’t do here
- You can describe what the patient shouldn’t do here
- You can describe what the patient should do here
- You can describe what the patient should do here

PREVENTION

PREVENTION STRATEGIES	DESCRIPTION
Regular eye exams	Venus is the second planet from the Sun
Healthy diet	Earth is the third planet from the Sun
Sunglasses	Despite being red, Mars is actually a cold planet
Quit smoking	Jupiter is the biggest planet of them all
Takes breaks during work	Saturn was named after a Roman god
Regular exercise	Mercury is the closest planet to the Sun

AWESOME WORDS

PREVALENCE



VENUS

Venus has a beautiful name

MERCURY

It's the closest planet to the Sun

MARS

Mars is actually a cold planet

Follow the link in the graph to modify its data and then paste the new one here. **For more info, click here**

CONCLUSION 1

Mercury is the closest planet to the Sun and the smallest one in the Solar System

CONCLUSION 2

Earth is the third planet from the Sun and the only one that harbors life in the Solar System

CONCLUSION 3

Mars is a cold place. It’s full of iron oxide dust, which gives the planet its reddish cast

TO REINFORCE THE CONCEPT, TRY USING AN IMAGE

Images reveal large amounts of data, so remember: use an image instead of a long text. Your audience will appreciate it

OUR TEAM

DR. SARAH JAMES

You can replace the image on the screen with your own

DR. JOHN DOE

You can replace the image on the screen with your own

REFERENCES

- AUTHOR (YEAR). *Title of the publication*. Publisher
- AUTHOR (YEAR). *Title of the publication*. Publisher
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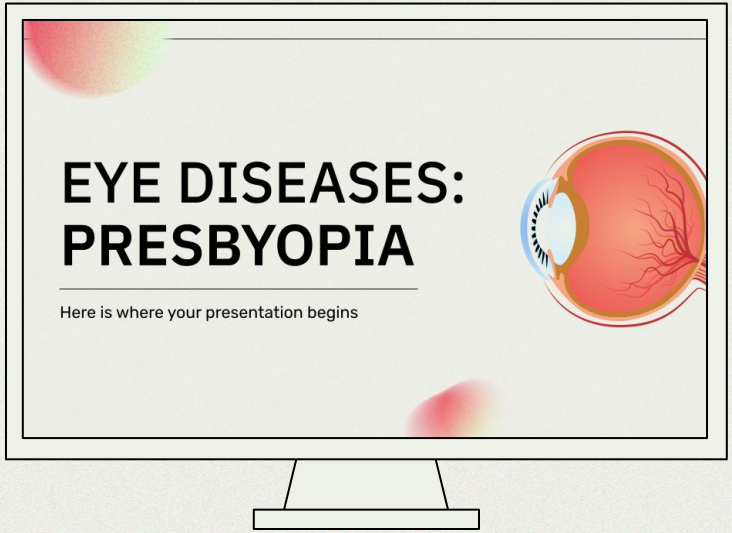
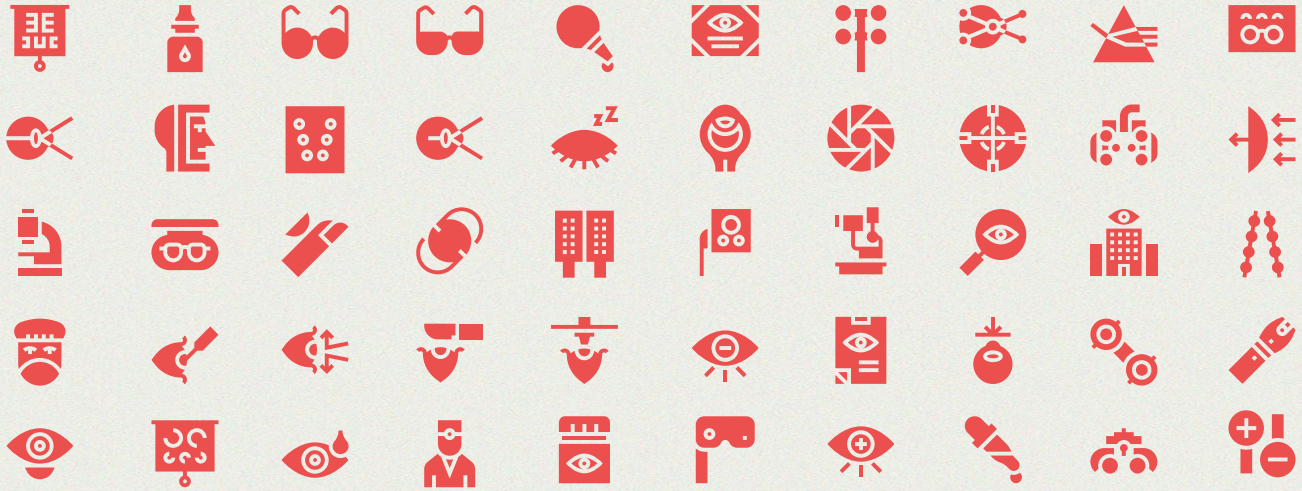
COMPUTER MOCKUP

You can replace the image on the screen with your own work. Just right-click on it and select “Replace image”



ICON PACK

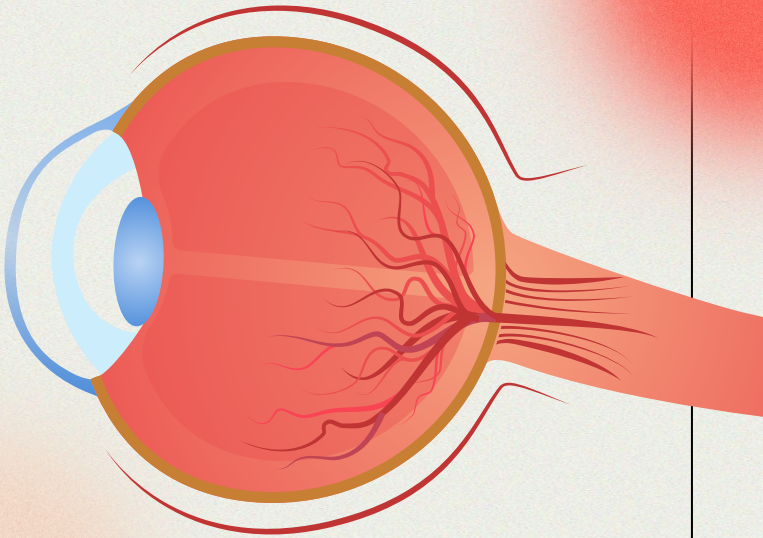


ALTERNATIVE RESOURCES

Here's an assortment of alternative resources whose style fits the one of this template:

VECTORS

- Party entertainment landing page template
- Human eyeball anatomy incision
- Eye anatomy illustration



RESOURCES

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ICONS

- Optometrist | Filled

VECTORS

- Coronavirus landing page with information
- Eye anatomy illustration
- Geometric sales discount facebook template
- Infographic medical healthcare

PHOTOS

- Portrait of male health worker
- Portrait of smiley female health worker
- Man having an eye sight check at an ophthalmology clinic
- Doctor testing patient eyesight