Detección de Niveles de Alzheimer según características extraídas de imágenes médicas y combinación de dataframe de OASIS 1-2

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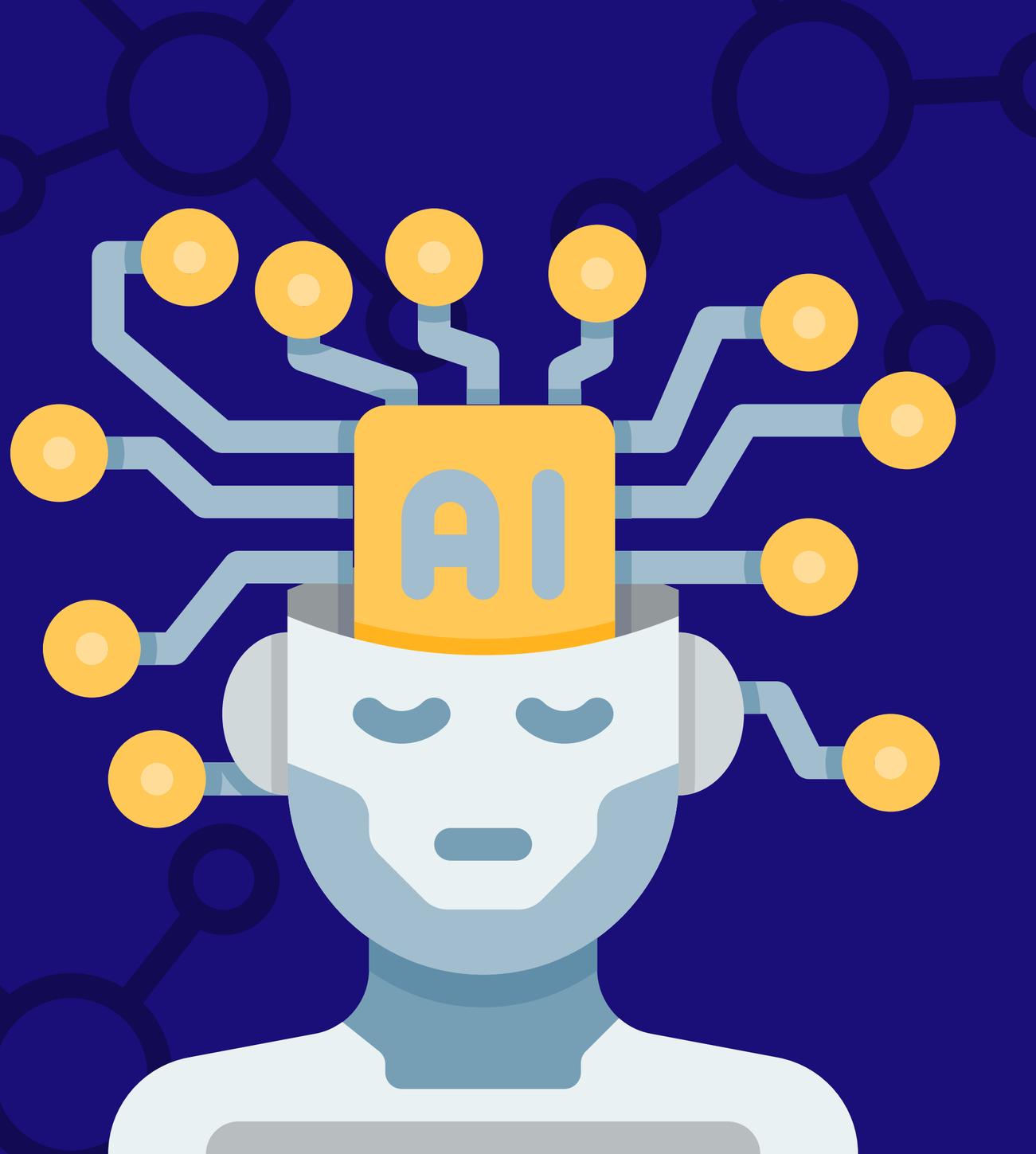
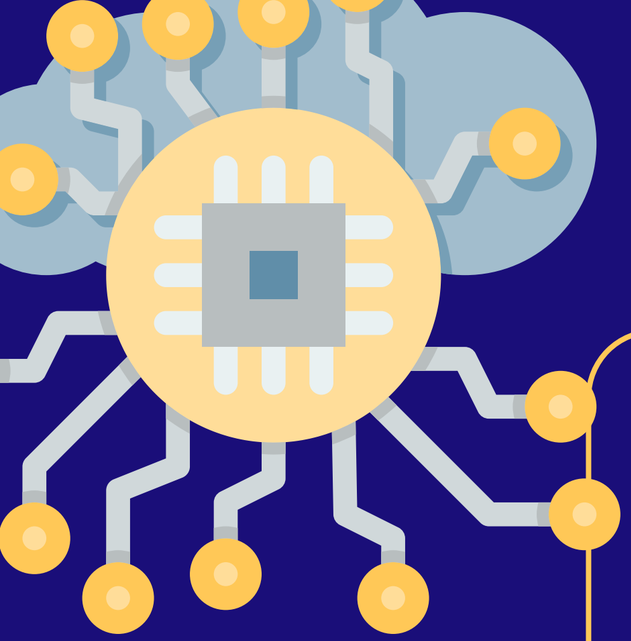


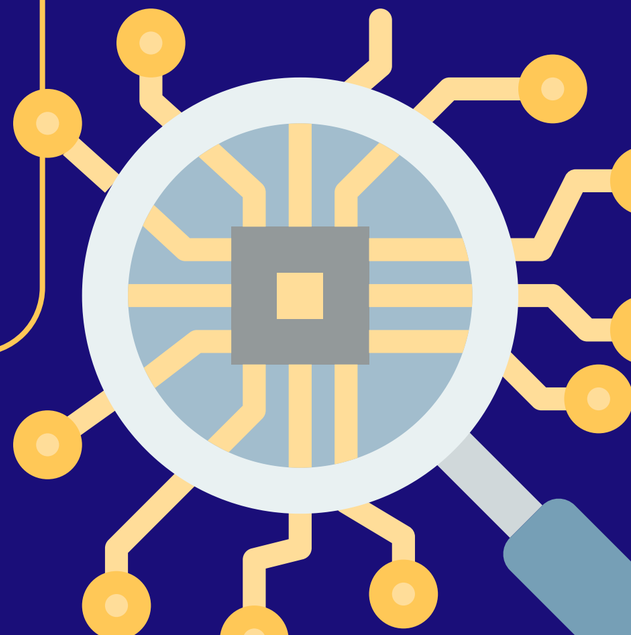
INTRODUCCIÓN

Enfermedad del Alzheimer (AD)

Acumulación de placas amiloides y ovillos neurofibrilares en el cerebro, lo que lleva a la atrofia cerebral. A medida que la enfermedad avanza, se observa un daño inicial en el hipocampo y la corteza entorrinal, áreas esenciales para la formación de los recuerdos

Actualmente, no existe una cura para la AD.
El diagnóstico temprano es crucial para el manejo de los síntomas y la planificación del cuidado





Las imágenes de resonancia magnética juegan un papel fundamental en la detección de cambios estructurales en el cerebro relacionados con la AD, ofreciendo una ventana para el diagnóstico temprano y la monitorización de la progresión de la enfermedad.

PROBLEMÁTICA

Similitud entre los datos de resonancia magnética de la EA y estándar de personas mayores sanas.

Identificar diferentes etapas de la EA (sin EA, muy leve, leve y moderada) se realice mediante examenes físicos (CDR y MMSE).

Base de Datos

Washington University School of Medicine in St. Louis

Open Access Series of Imaging Studies (OASIS)

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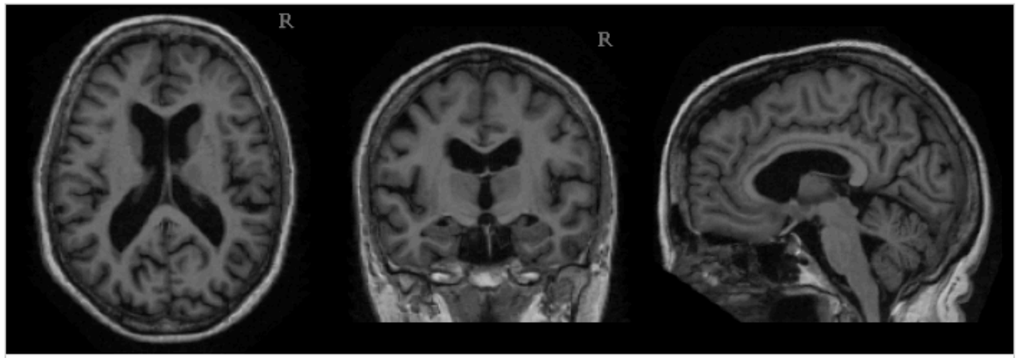

The Open Access Series of Imaging Studies (OASIS) is a project aimed at making neuroimaging data sets of the brain freely available to the scientific community. By compiling and freely distributing neuroimaging data sets, we hope to facilitate future discoveries in basic and clinical neuroscience.

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- OASIS-1
- OASIS-2
- OASIS-3
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- Request Access to Datasets
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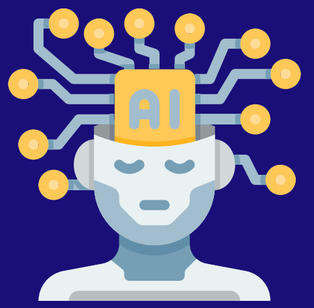


OASIS 1

Cross-sectional MRI Data in Young, Middle Aged, Nondemented and Demented Older Adults

Summary

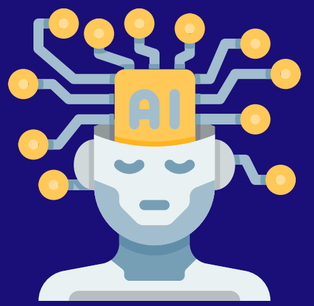
This set consists of a cross-sectional collection of 416 subjects aged 18 to 96. For each subject, 3 or 4 individual T1-weighted MRI scans obtained in single scan sessions are included. The subjects are all right-handed and include both men and women. 100 of the included subjects over the age of 60 have been clinically diagnosed with very mild to moderate Alzheimer's disease (AD). Additionally, a reliability data set is included containing 20 nondemented subjects imaged on a subsequent visit within 90 days of their initial session.

Subjects

416

MR Sessions

434



EDA

	ID	M/F	Hand	Age	Educ	SES	MMSE	CDR	eTIV	nWBV	ASF	Delay
0	OAS1_0001_MR1	F	R	74	2.0	3.0	29.0	0.0	1344	0.743	1.306	NaN
1	OAS1_0002_MR1	F	R	55	4.0	1.0	29.0	0.0	1147	0.810	1.531	NaN
2	OAS1_0003_MR1	F	R	73	4.0	3.0	27.0	0.5	1454	0.708	1.207	NaN
3	OAS1_0004_MR1	M	R	28	NaN	NaN	NaN	NaN	1588	0.803	1.105	NaN
4	OAS1_0005_MR1	M	R	18	NaN	NaN	NaN	NaN	1737	0.848	1.010	NaN

EDA

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 436 entries, 0 to 435
Data columns (total 12 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   ID      436 non-null    object 
 1   M/F     436 non-null    object 
 2   Hand    436 non-null    object 
 3   Age     436 non-null    int64  
 4   Educ    235 non-null    float64
 5   SES     216 non-null    float64
 6   MMSE    235 non-null    float64
 7   CDR     235 non-null    float64
 8   eTIV    436 non-null    int64  
 9   nWBV    436 non-null    float64
 10  ASF     436 non-null    float64
 11  Delay   20 non-null     float64
dtypes: float64(7), int64(2), object(3)
```

EDA

```
df0 = df.dropna(subset=['CDR', 'MMSE'])
df0 = df0.drop(columns=['Delay'])
df0['SES'].fillna(df0['SES'].mean(), inplace=True)
df0
```

	ID	M/F	Hand	Age	Educ	SES	MMSE	CDR	eTIV	nWBV	ASF
0	OAS1_0001_MR1	F	R	74	2.0	3.0	29.0	0.0	1344	0.743	1.306
1	OAS1_0002_MR1	F	R	55	4.0	1.0	29.0	0.0	1147	0.810	1.531
2	OAS1_0003_MR1	F	R	73	4.0	3.0	27.0	0.5	1454	0.708	1.207
8	OAS1_0010_MR1	M	R	74	5.0	2.0	30.0	0.0	1636	0.689	1.073
9	OAS1_0011_MR1	F	R	52	3.0	2.0	30.0	0.0	1321	0.827	1.329
...	...	...	...	...	...	...	...	...	...	...	...
411	OAS1_0453_MR1	F	R	70	1.0	4.0	29.0	0.5	1295	0.748	1.355
412	OAS1_0454_MR1	F	R	73	3.0	2.0	23.0	0.5	1536	0.730	1.142
413	OAS1_0455_MR1	F	R	61	2.0	4.0	28.0	0.0	1354	0.825	1.297
414	OAS1_0456_MR1	M	R	61	5.0	2.0	30.0	0.0	1637	0.780	1.072
415	OAS1_0457_MR1	F	R	62	3.0	3.0	26.0	0.0	1372	0.766	1.279

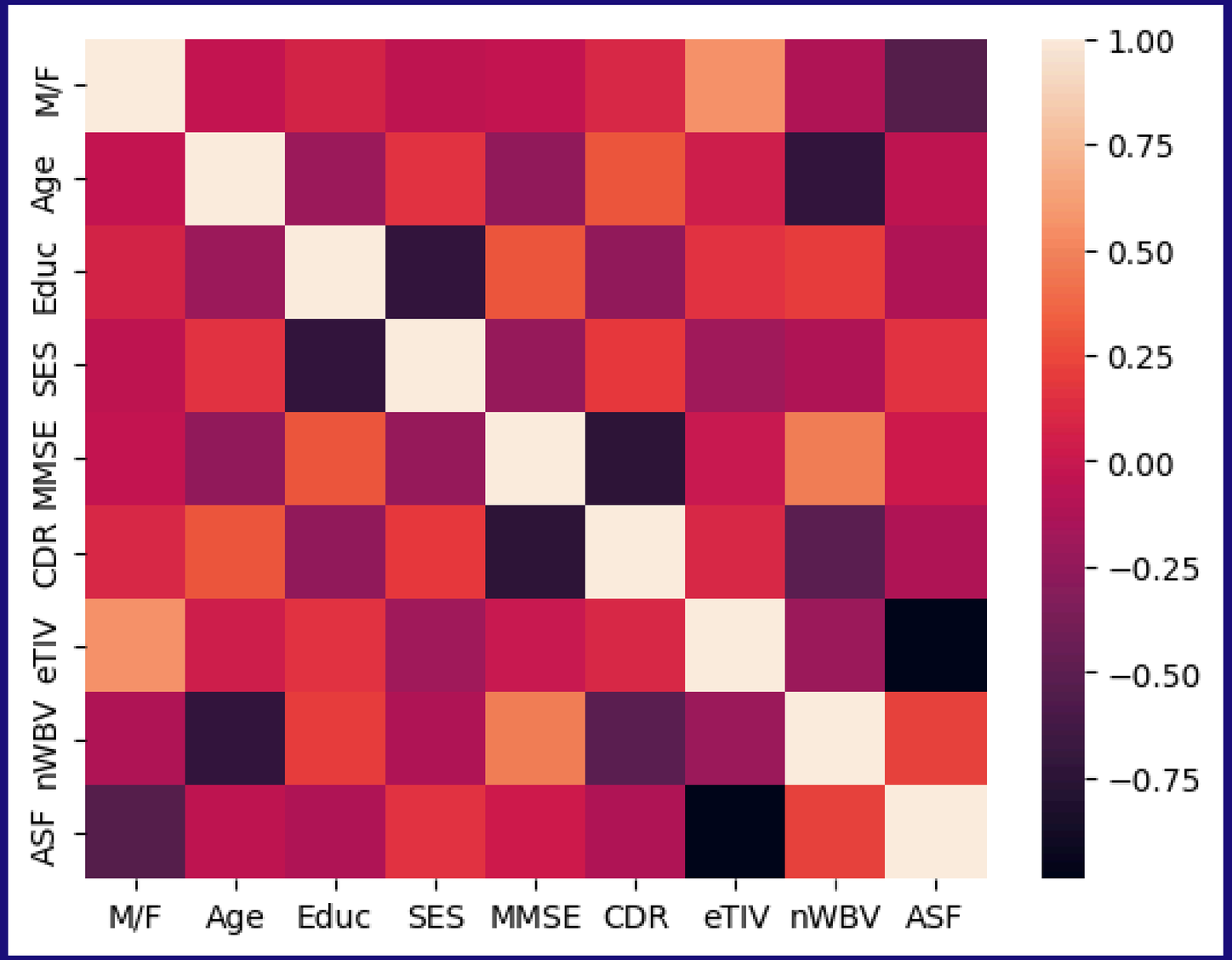
235 rows × 11 columns

EDA

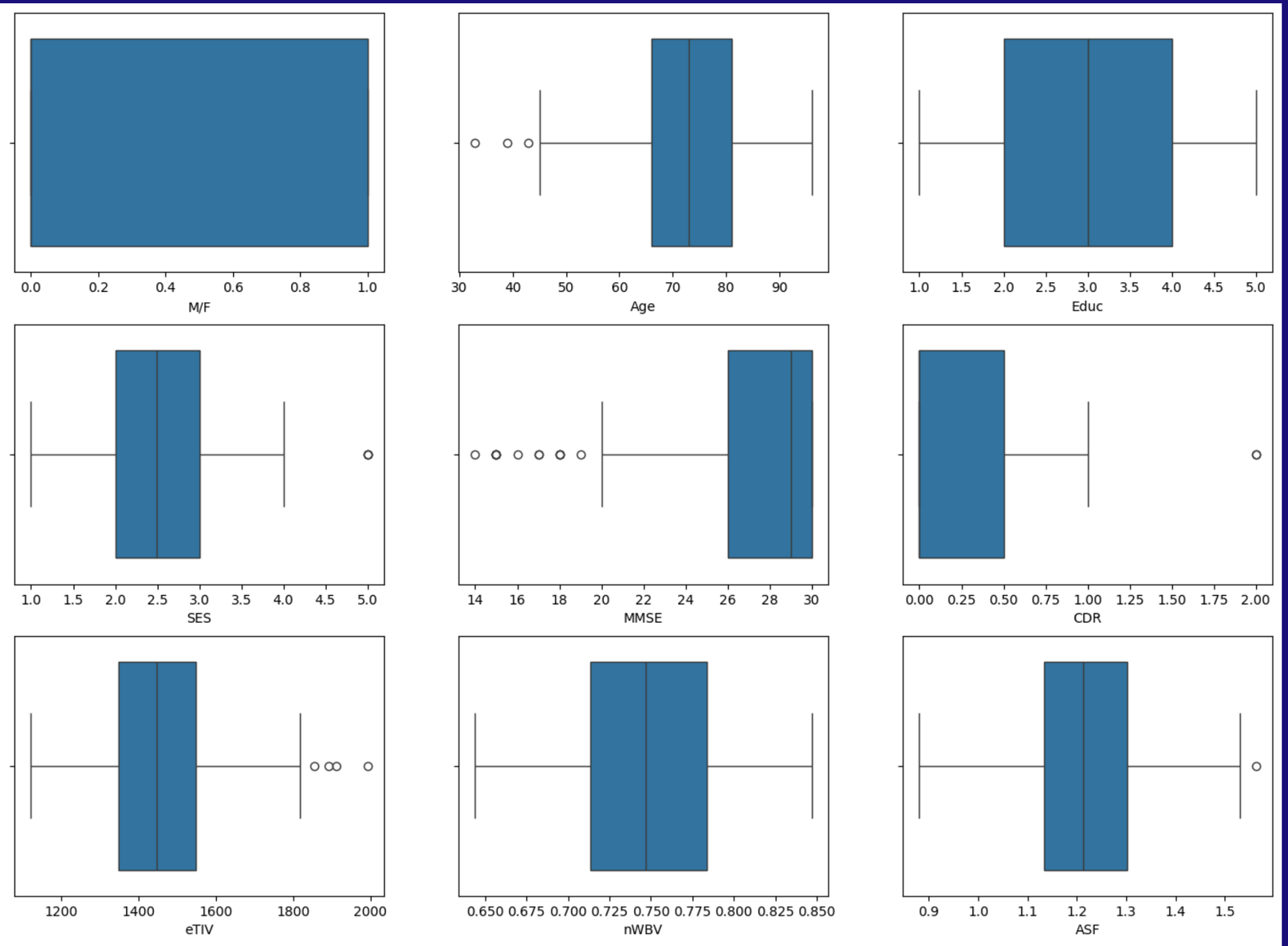
```python
def encode_sex(sex):
    if sex == 'M':
        return 1
    elif sex == 'F':
        return 0
    else:
        return None  # Handle other cases if necessary

df0['M/F'] = df0['M/F'].apply(encode_sex)
df0
```

	ID	M/F	Hand	Age	Educ	SES	MMSE	CDR	eTIV	nWBV	ASF
0	OAS1_0001_MR1	0	R	74	2.0	3.0	29.0	0.0	1344	0.743	1.306
1	OAS1_0002_MR1	0	R	55	4.0	1.0	29.0	0.0	1147	0.810	1.531
2	OAS1_0003_MR1	0	R	73	4.0	3.0	27.0	0.5	1454	0.708	1.207
8	OAS1_0010_MR1	1	R	74	5.0	2.0	30.0	0.0	1636	0.689	1.073
9	OAS1_0011_MR1	0	R	52	3.0	2.0	30.0	0.0	1321	0.827	1.329

EDA


M/F
Age
Educ
SES
MMSE
CDR
eTIV
nWBV
ASF
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75

EDA

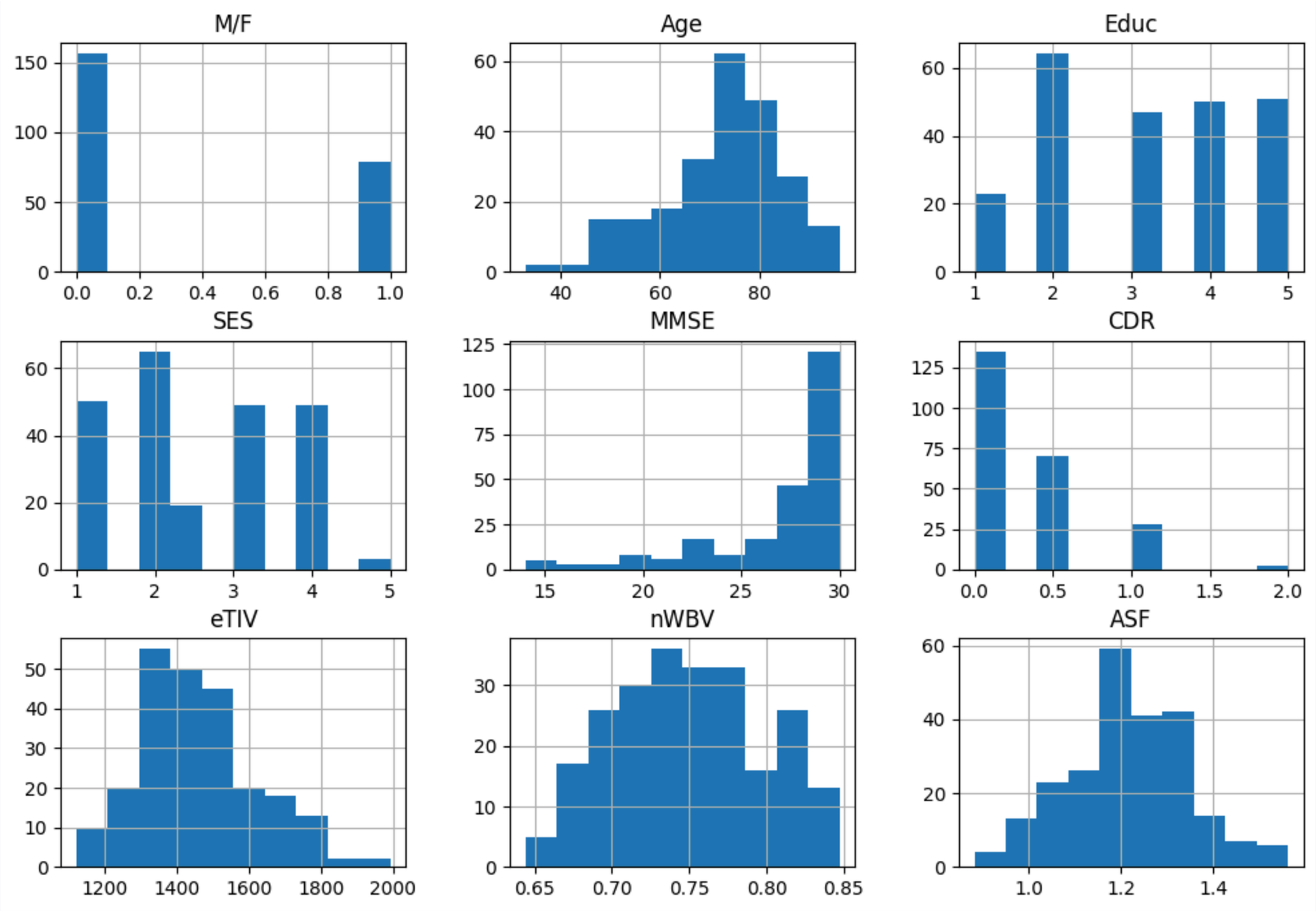


MMSE score range	Number of patients (%)
9–14 (Severe)	45 (45)
15–19 (Moderate)	32 (32)
20–30 (Mild)	23 (23)

MMSE: Mini-mental state examination

CDR; 0= nondemented; 0.5 – very mild dementia; 1 = mild dementia; 2 = moderate dementia (Morris, 1993)

EDA



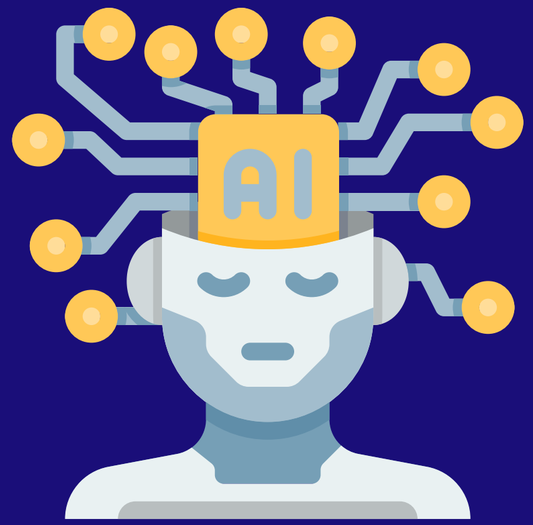
Variables

Table 4. Measures Included in the Data Set

Age	Age at time of image acquisition (years)
Sex	Sex (male or female)
Education	Years of education
Socioeconomic status	Assessed by the Hollingshead Index of Social Position and classified into categories from 1 (*highest status*) to 5 (*lowest status*) (Hollingshead, 1957)
MMSE score	Ranges from 0 (*worst*) to 30 (*best*) (Folstein, Folstein, & McHugh, 1975)
CDR scale	0 = no dementia, 0.5 = very mild AD, 1 = mild AD, 2 = moderate AD (Morris, 1993)

VARIABLES

- ID: Identificación del usuario
- M/F: Genero del paciente
- Hand: Si es surdo o diestro (L o F)
- Age: Edad
- Educ: Nivel de educación
- SES: Nivel socioeconómico
- MMSE: Herramienta de evaluación cognitiva
- CDR: nivel de demencia
- eTIV: espacio intercranial
- nWBV: Área de materia gris o blanca
- ASF: Factor de escala calculado que transforma el espacio nativo del cerebro y el cráneo al objetivo del atlas
- delay



Gracias

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