**🔹 Explained Variance Ratio:**

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This tells us **how much of the original information (variance)** is captured by each **principal component**:

| **Principal Component** | **Variance Explained** | **Meaning** |
| --- | --- | --- |
| PC1 | ~97.97% | Almost all meaningful variation is here. You can reduce to this single dimension and keep the core information. |
| PC2 | ~2.00% | Adds a little nuance, but not much. |
| PC3 | ~0.03% | Almost no useful information. Likely just noise. |

**Meaning :** You can reduce a 3D dataset to just 1D (PC1) without losing much."

**🔹 Feature Loadings (Contribution to PCs):**

A screen shot of a computer

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Each row shows **how much each original variable contributes to each PC**:

**PC1:**

* Attendance, Study Hours, and Attention Span all contribute **almost equally** (~0.57-0.58)
* PC1 is a **balanced summary** of all three traits.

**PC2:**

* Attendance contributes heavily (0.80)
* Attention Span has a strong **negative** impact (-0.54)
* Study Hours barely influences PC2

**PC3:**

* Mostly defined by **Study Hours** and **Attention Span**, but again not very important (low variance explained)

**Meaning:**

"PC1 is the most useful and combines all behaviors equally. PC2 and PC3 show small secondary contrasts but are less important."

**🔹 PCA Transformed Data:**

A screenshot of a computer

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Each row is the **compressed version of a student’s profile** in the PCA space.

* **PC1** separates students very clearly:
  + Student A (C-) has the **lowest** PC1 → poor behavior
  + Student D (A+) has the **highest** PC1 → strong behavior
* **PC2 and PC3** don’t follow the grade trend as clearly. Their values jump around and don’t contribute much meaningfully.

**Meaning:**

“We can now describe a student’s behavior using just a single number (PC1). The higher the PC1, the better their academic performance is likely to be.”

A graph with colored dots

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A screenshot of a black screen

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