Taller NoSQL: MongoDB Compass + MNIST

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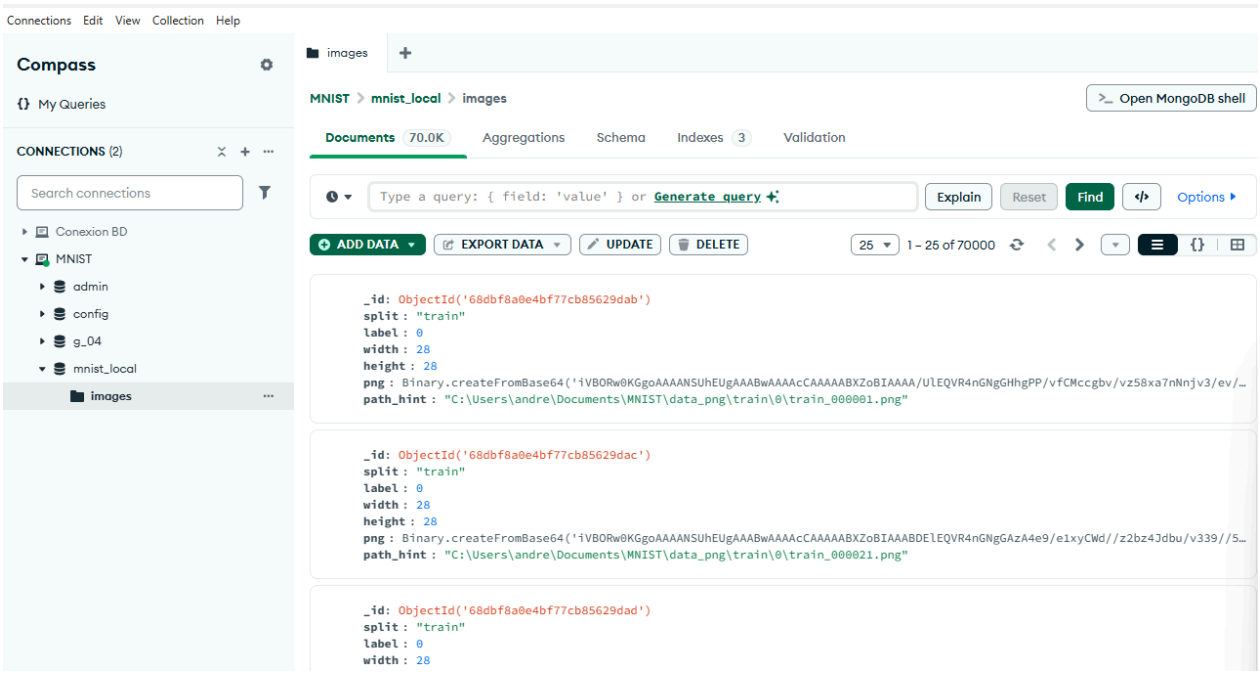
conversión a PNG e inserción a Compass desde Júpiter Notebook de Colección MNIST y Colección Images:

```
Inserción train: 60000it [00:32, 1858.81it/s]
Insertados 60000 documentos en split='train'.
Inserción test: 10000it [00:02, 3433.42it/s]
Insertados 10000 documentos en split='test'.
{'ns': 'mnist_local.images',
 'size': 30279875,
 'count': 70000,
 'avgObjSize': 432,
 'numOrphanDocs': 0,
 'storageSize': 38694912,
 'freeStorageSize': 22306816,
 'capped': False,
 'wiredTiger': {'metadata': {'formatVersion': 1},
  'creationString': 'access_pattern_hint=none,allocation_size=4KB,app_metadata=(formatVersion=1),assert=(commit_timestamp=none,durable_timestamp=none,read_timestamp=none,write_timestamp=off),block_allocation=best,block_compressor=snappy,cache_resident=false,checksum=on,colgroups=,collator=,columns=,dictionary=0,encryption=(keyid=,name=),exclusive=false,extractor=,format=btree,huffman_key=,huffman_value=,ignore_in_memory_cache_size=false,immutable=false,import=(compare_timestamp=oldest_timestamp,enabled=false,file_metadata=,metadata_file=,panic_corrupt=true,repair=false),internal_item_max=0,internal_key_max=0,internal_key_truncate=true,internal_page_max=4KB,key_format=q,key_gap=10,leaf_item_max=0,leaf_key_max=0,leaf_page_max=32KB,leaf_value_max=64MB,log=(enabled=true),lsm=(auto_throttle=true,bloom=true,bloom_bit_count=16,bloom_config=,bloom_hash_count=8,bloom_oldest=false,chunk_count_limit=0,chunk_max=5GB,chunk_size=10MB,merge_custom=(prefix=,start_generation=0,suffix=),merge_max=15,merge_min=0),memory_page_image_max=0,memory_page_max=10m,os_cache_dirty_max=0,os_cache_max=0,prefix_compression=false,prefix_compression_min=4,source=,split_deepen_min_child=0,split_deepen_per_child=0,split_pct=90,tiered_storage=(auth_token=,bucket=,bucket_prefix=,cache_directory=,local_retention=300,name=,object_target_size=0),type=file,value_format=u,verbose=[],write_timestamp_usage=none',
  'type': 'file',
```

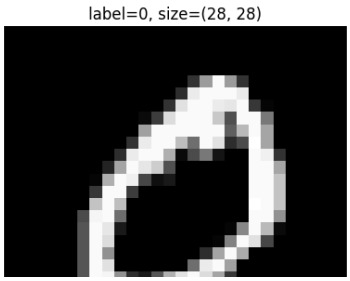


Visualización Rápida en NoteBook:

5) Visualización rápida desde MongoDB

[18]:
```
import matplotlib.pyplot as plt

doc = coll.find_one({"split":"train"})
img = Image.open(io.BytesIO(doc["png"]))
plt.imshow(img, cmap="gray")
plt.title(f'label={doc["label"]}, size={img.size}')
plt.axis("off")
plt.show()
```



Modelo keras y Entrenamiento:

```
model.save("models/mnist_model.keras")

# (opcional) formato HDF5 legado (.h5) — mostrará un WARNING, pero funciona
model.save("models/mnist_model.h5")

# Para exportar a SavedModel (carpeta) para TF Serving / TFLite:
model.export("models/mnist_savedmodel")   # <-- ESTA es la API correcta en Keras 3
```

```
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save_model(model)`. This file format is considered legacy. W
e recommend using instead the native Keras format, e.g. `model.save('my_model.keras')` or `keras.saving.save_model(model, 'my_model.keras')`.
Saved artifact at 'models/mnist_savedmodel'. The following endpoints are available:

* Endpoint 'serve'
  args_0 (POSITIONAL_ONLY): TensorSpec(shape=(None, 28, 28, 1), dtype=tf.float32, name='keras_tensor')
Output Type:
  TensorSpec(shape=(None, 10), dtype=tf.float32, name=None)
Captures:
  1795916101584: TensorSpec(shape=(), dtype=tf.resource, name=None)
  1795914436048: TensorSpec(shape=(), dtype=tf.resource, name=None)
  1795919242128: TensorSpec(shape=(), dtype=tf.resource, name=None)
  1795916089488: TensorSpec(shape=(), dtype=tf.resource, name=None)
  1795916101776: TensorSpec(shape=(), dtype=tf.resource, name=None)
  1795919240400: TensorSpec(shape=(), dtype=tf.resource, name=None)
  1795717346128: TensorSpec(shape=(), dtype=tf.resource, name=None)
  1795717347856: TensorSpec(shape=(), dtype=tf.resource, name=None)
```

[22]:
```
%gui qt
```

Funcionamiento: