Parameter Study: exponential_high
## Exponential(λ=0.05) × 2.0: Fast decay, clustering near zero
Char Data Type, 64KB Chunk Size
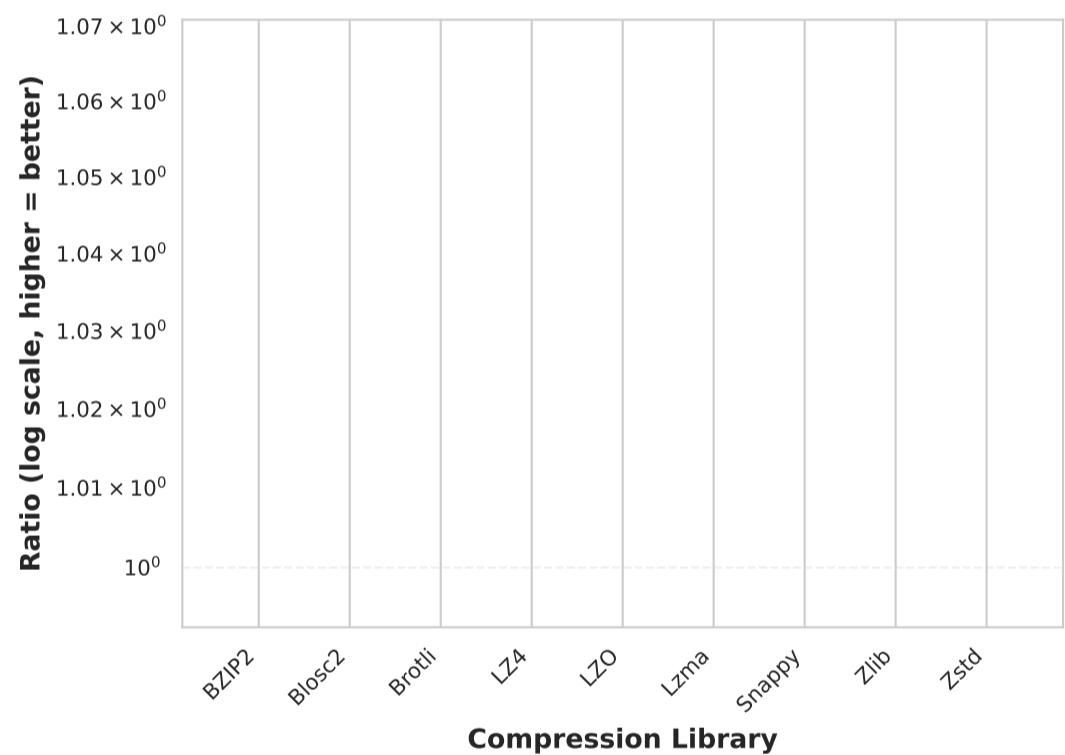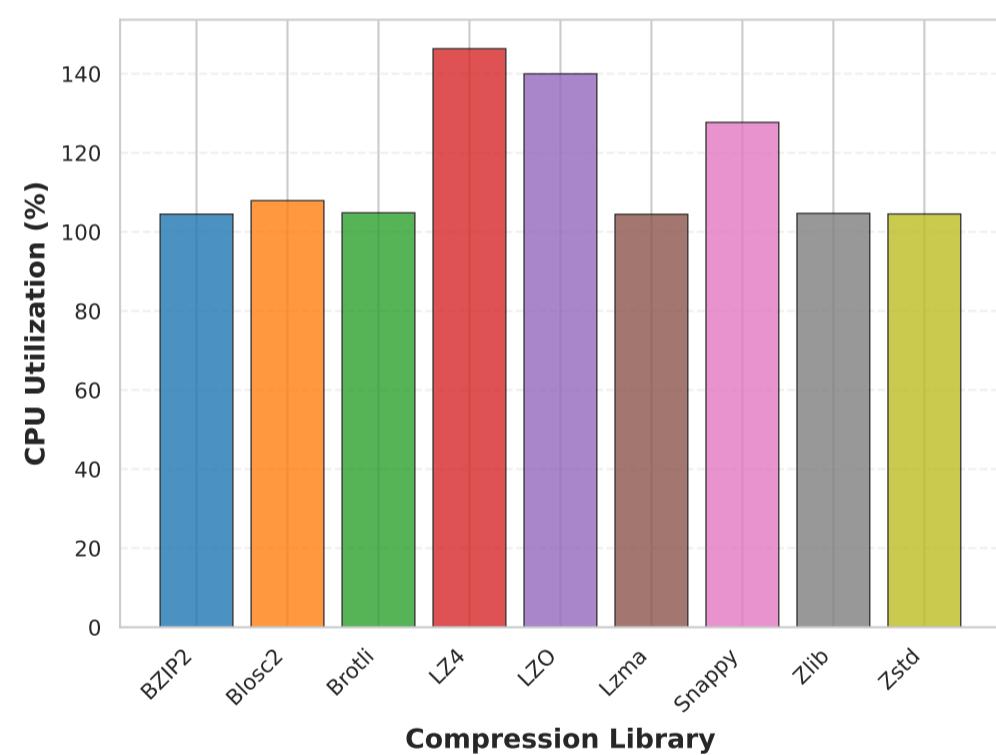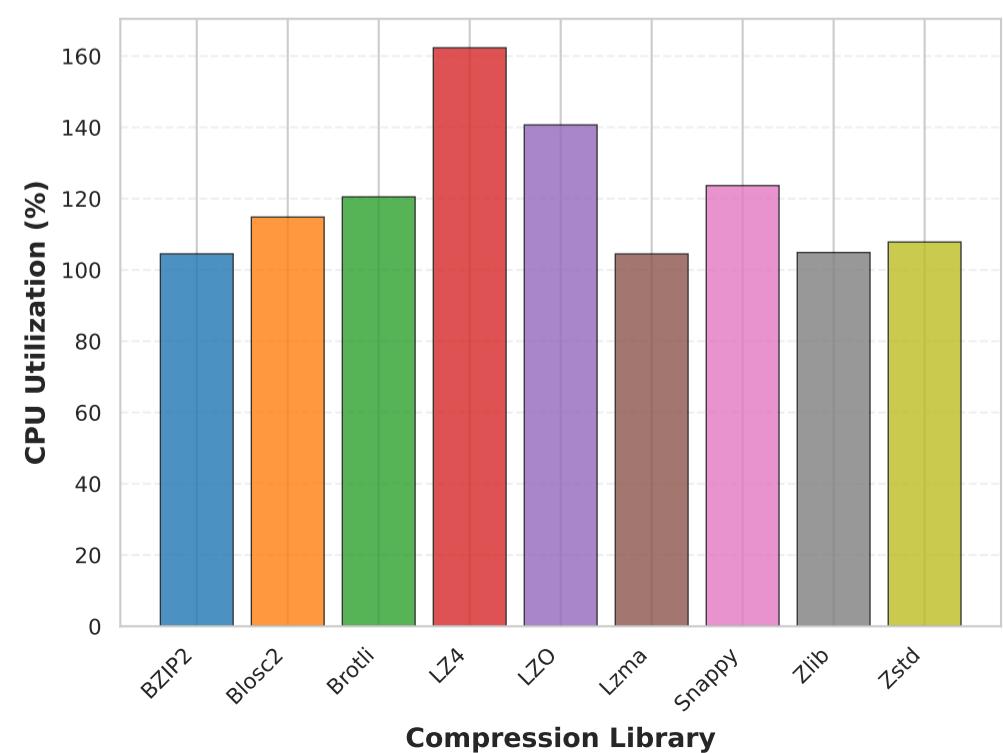
**Compression Time**

**Decompression Time**

Compression Ratio

Compression CPU Usage

Decompression CPU Usage
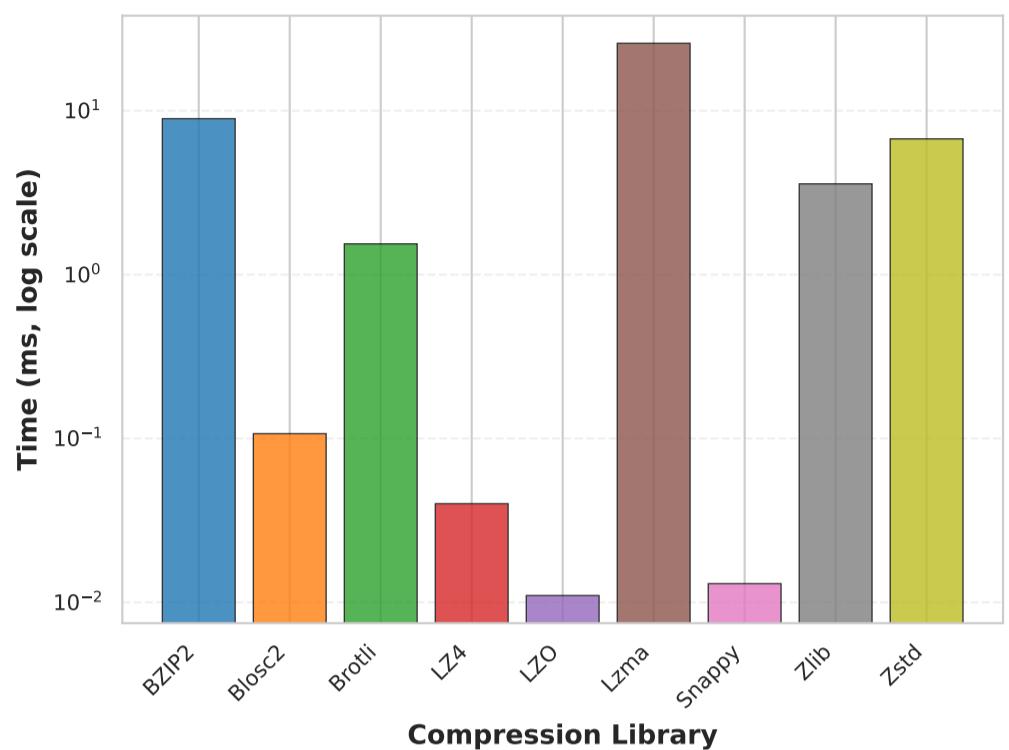
Performance Summary (64KB chunks)
Sorted by Compression Ratio
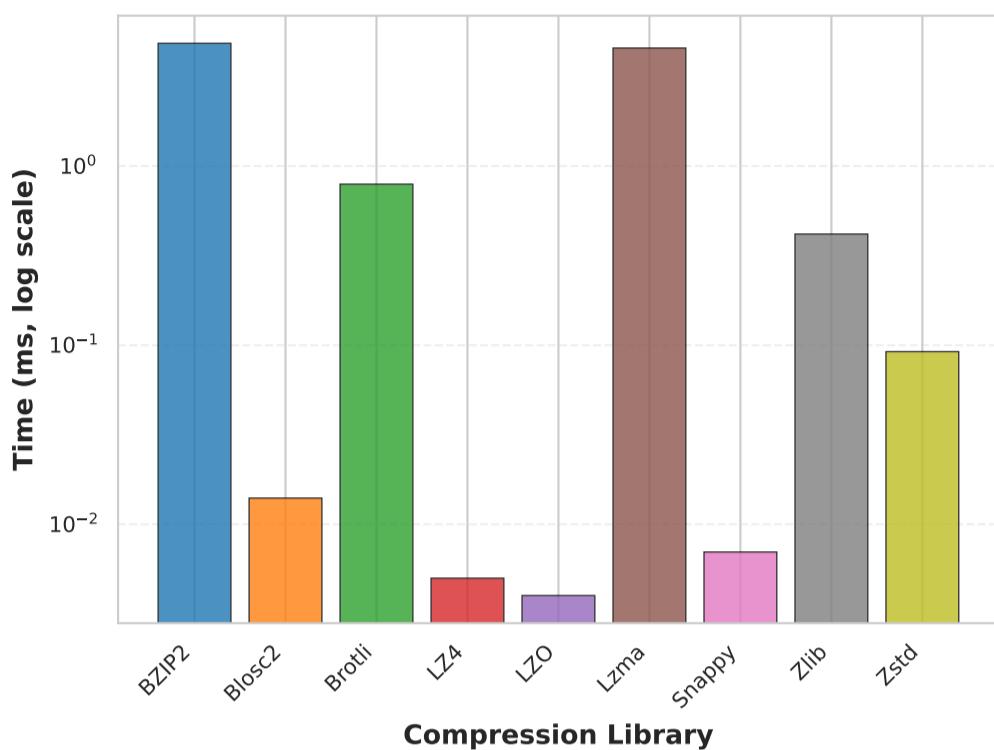
Library	Ratio	Time (ms)	CPU%
Zstd	1.07x	5.7	105%
Zlib	1.06x	2.1	105%
Lzma	1.05x	19.5	104%
BZIP2	1.01x	8.1	104%
Brotli	1.00x	1.2	105%
Snappy	1.00x	0.0	128%
Blosc2	1.00x	0.2	108%
LZ4	1.00x	0.0	146%
LZO	1.00x	0.0	140%

Parameter Study: exponential_incomp
Exponential(λ=0.01) × 1.5 + noise: Slow decay, high entropy
Char Data Type, 64KB Chunk Size
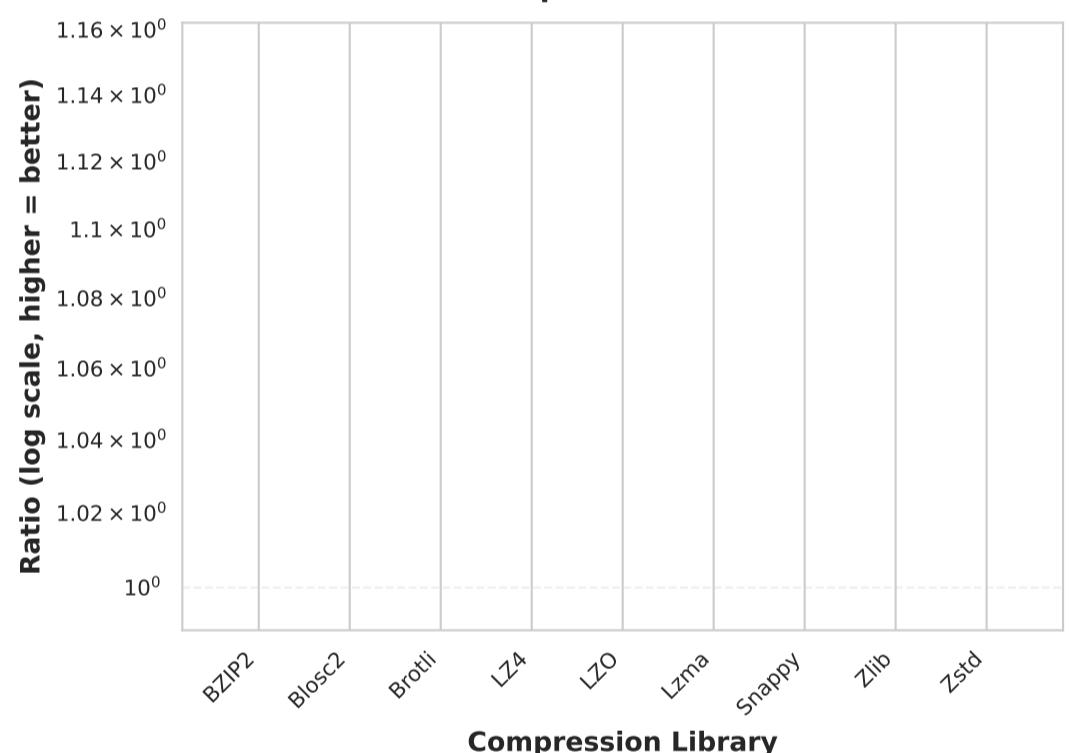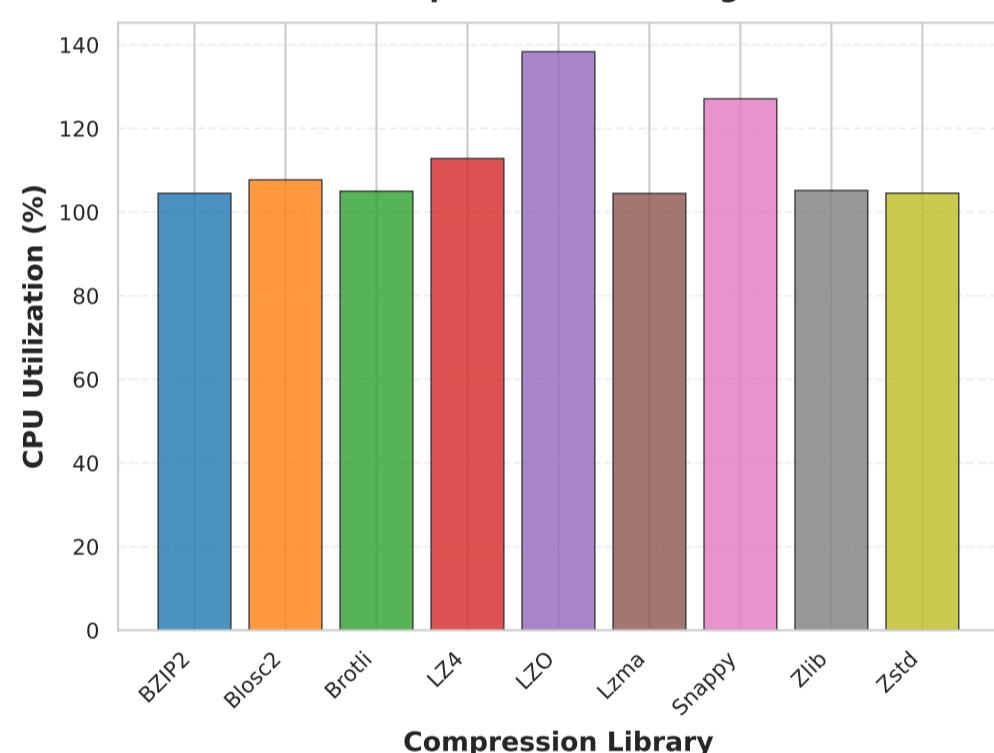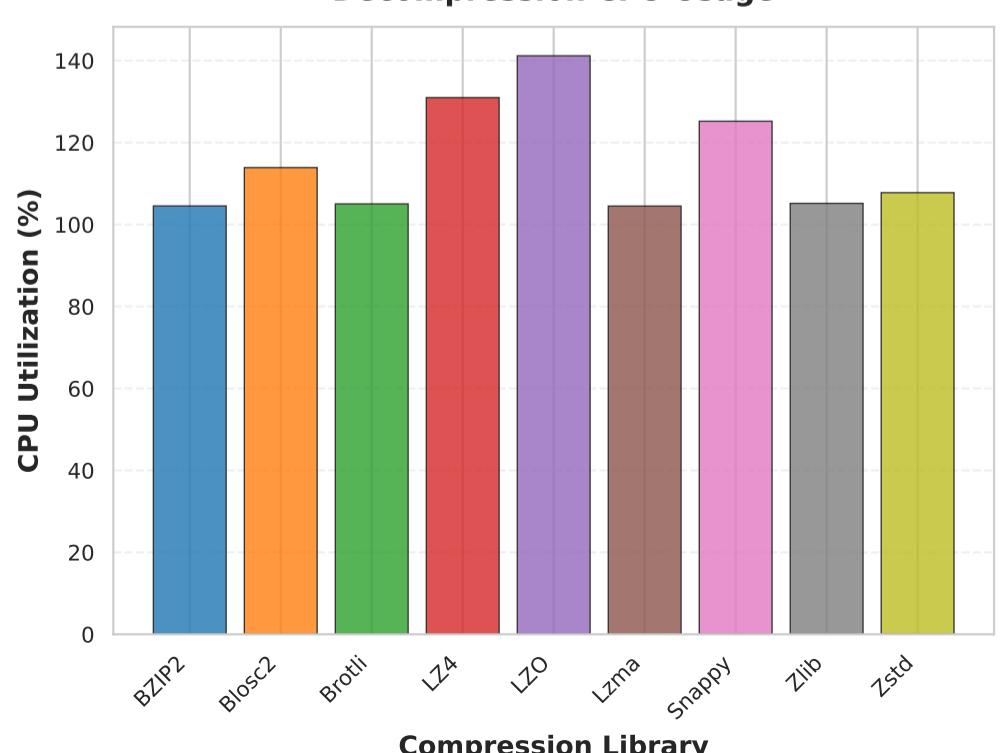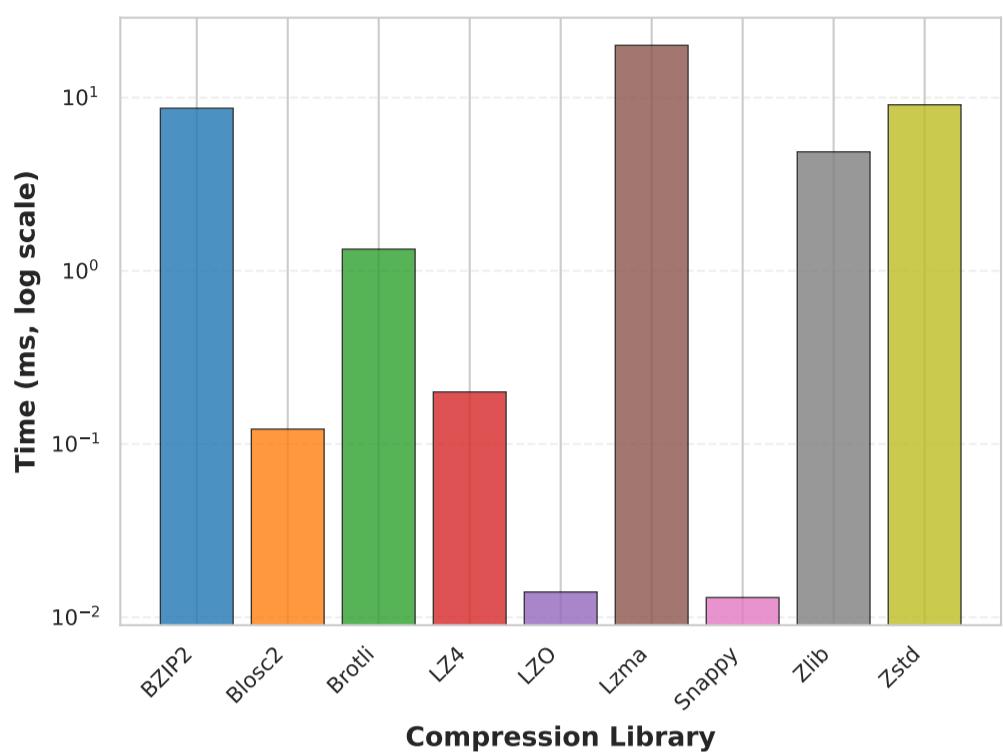
Performance Summary (64KB chunks)
**Sorted by Compression Ratio**
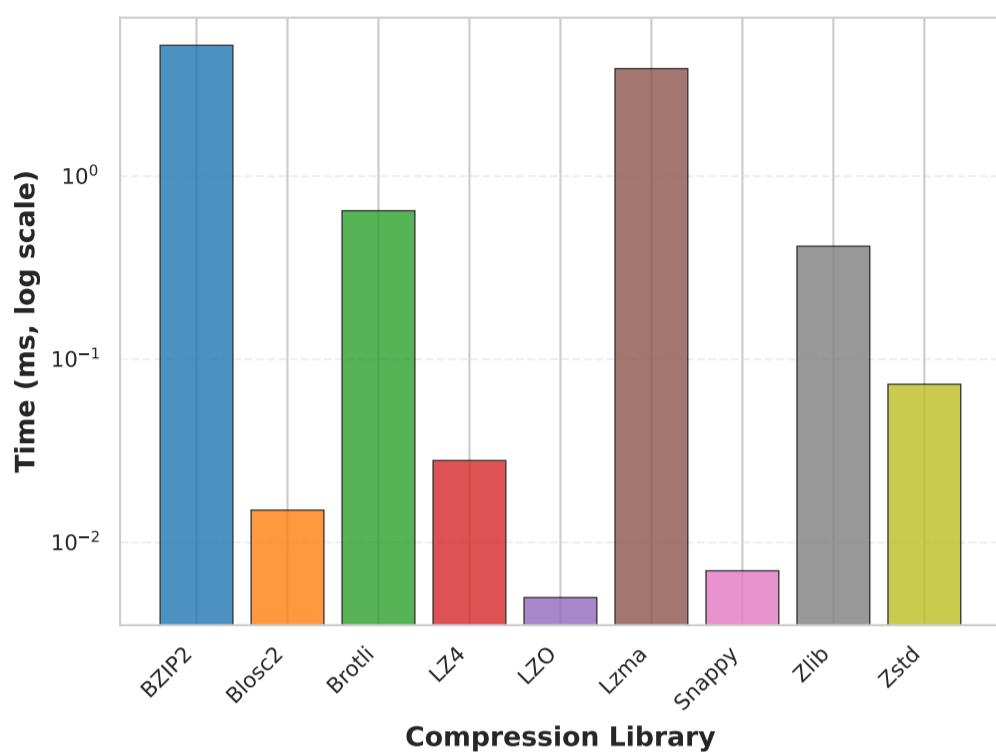
Library	Ratio	Time (ms)	CPU%
Zstd	1.15x	6.7	105%
Lzma	1.14x	25.8	104%
Zlib	1.12x	3.6	105%
BZIP2	1.05x	9.0	104%
Brotli	1.03x	1.5	105%
Snappy	1.00x	0.0	127%
Blosc2	1.00x	0.1	108%
LZ4	1.00x	0.0	113%
LZO	1.00x	0.0	138%

Parameter Study: exponential_light
Exponential(λ=0.012) × 2.5 + 10: Slow decay, wide spread
Char Data Type, 64KB Chunk Size
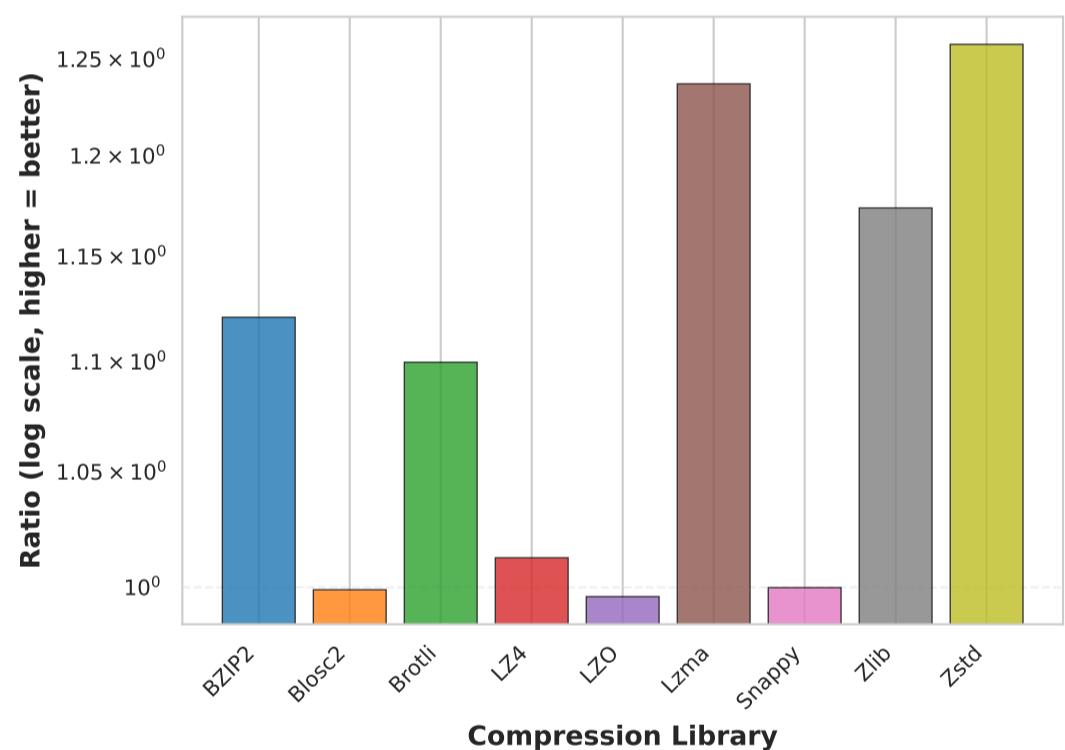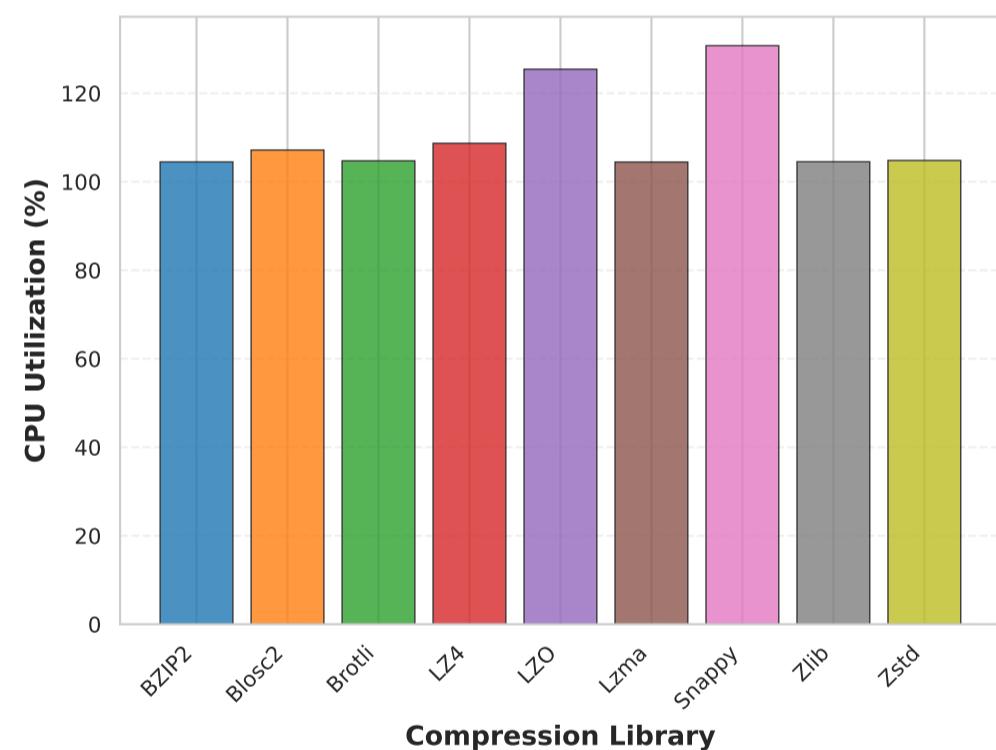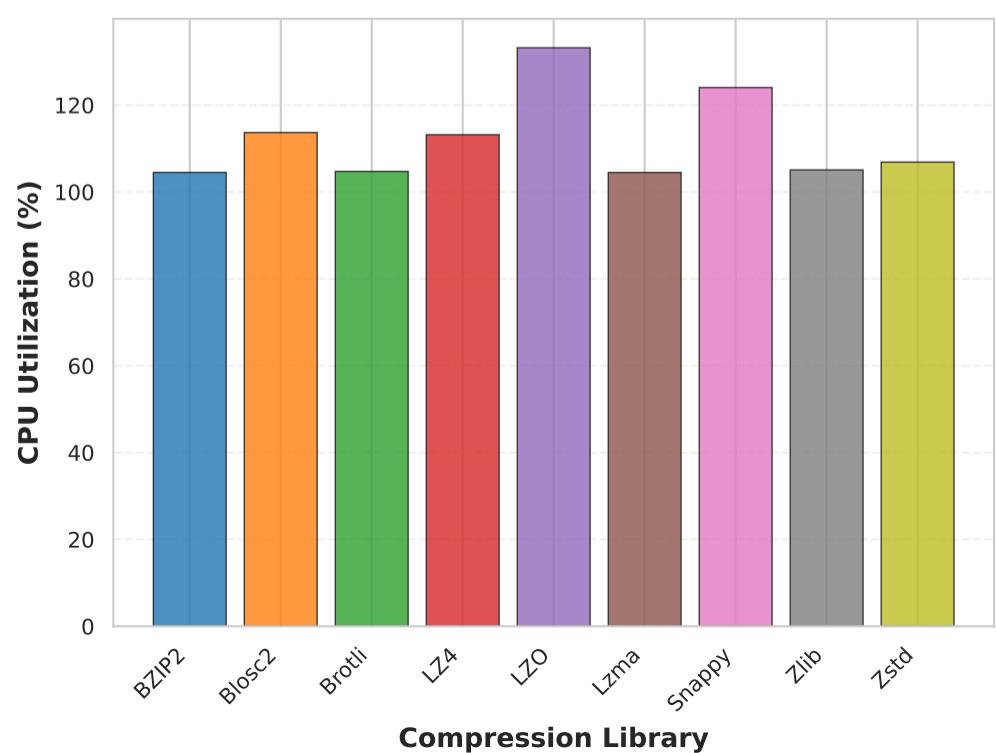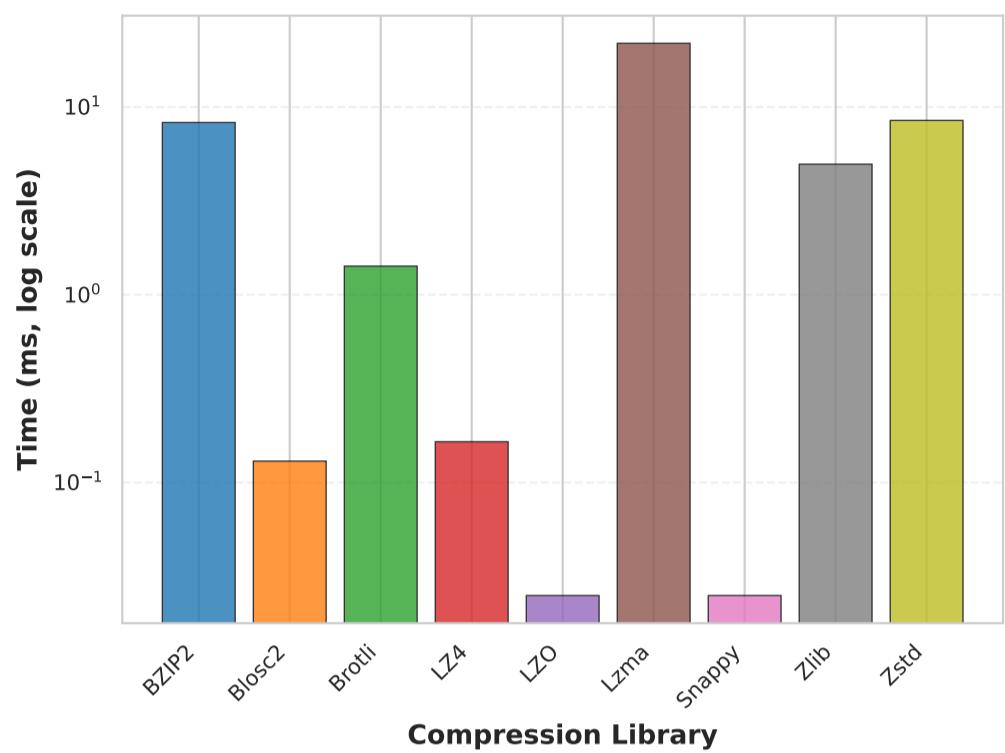
Performance Summary (64KB chunks)
Sorted by Compression Ratio
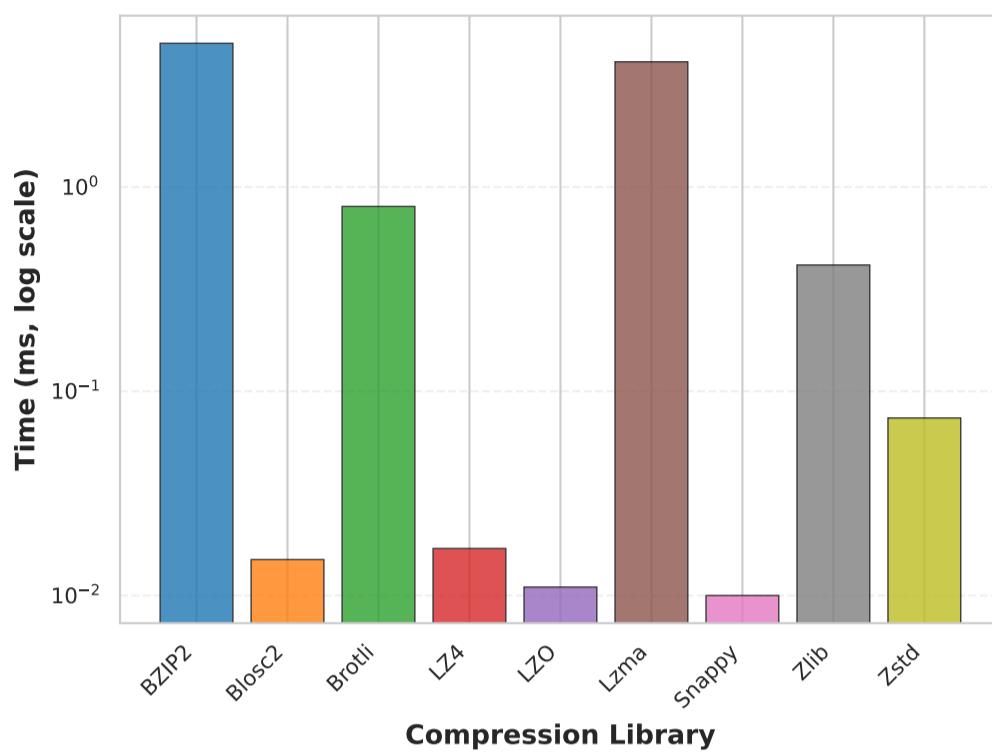
Library	Ratio	Time (ms)	CPU%
Zstd	1.26x	9.1	105%
Lzma	1.24x	20.1	104%
Zlib	1.17x	4.9	105%
BZIP2	1.12x	8.7	104%
Brotli	1.10x	1.3	105%
LZ4	1.01x	0.2	109%
Snappy	1.00x	0.0	131%
Blosc2	1.00x	0.1	107%
LZO	1.00x	0.0	125%

Parameter Study: exponential_medium
Exponential(λ=0.02) × 3.0 + 5: Moderate decay
## Char Data Type, 64KB Chunk Size
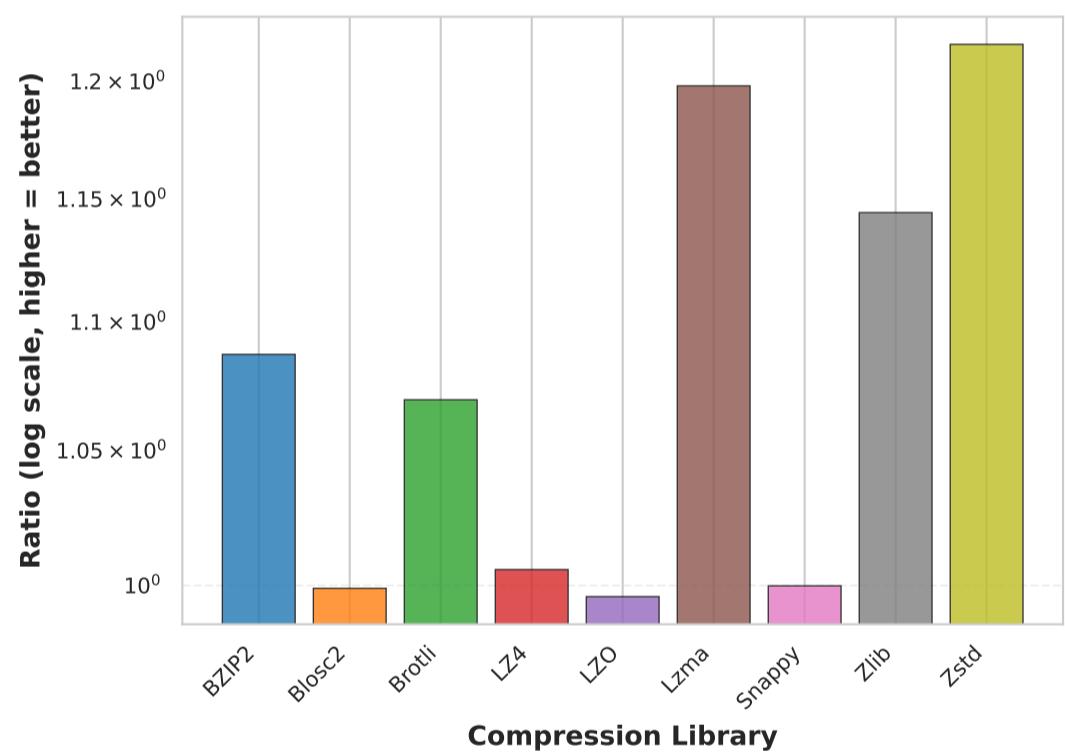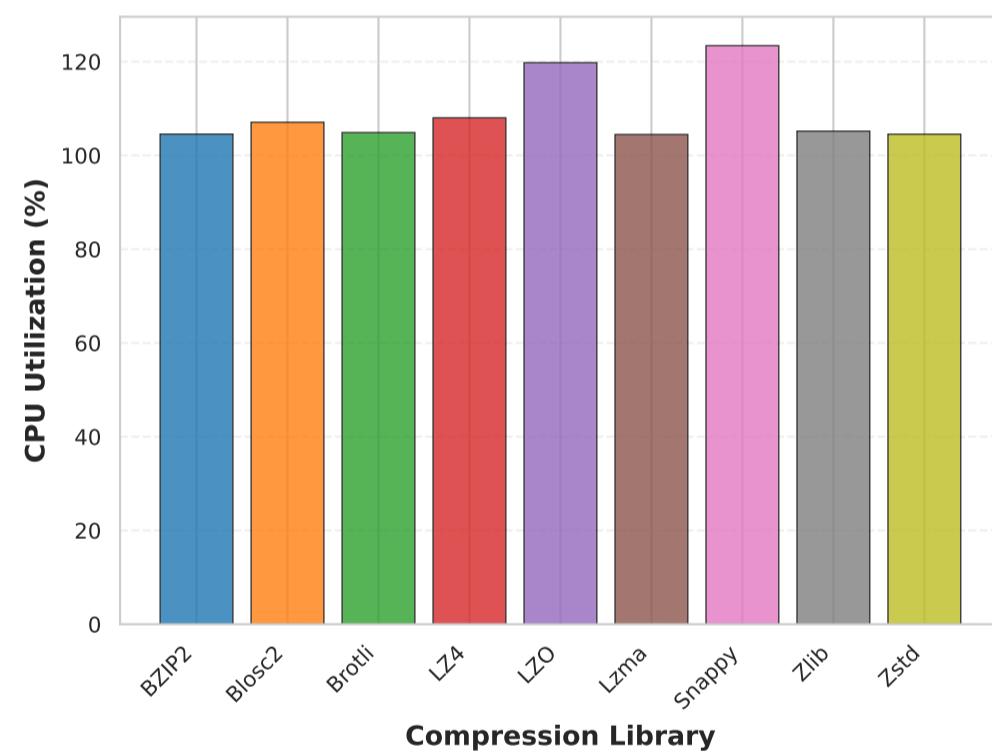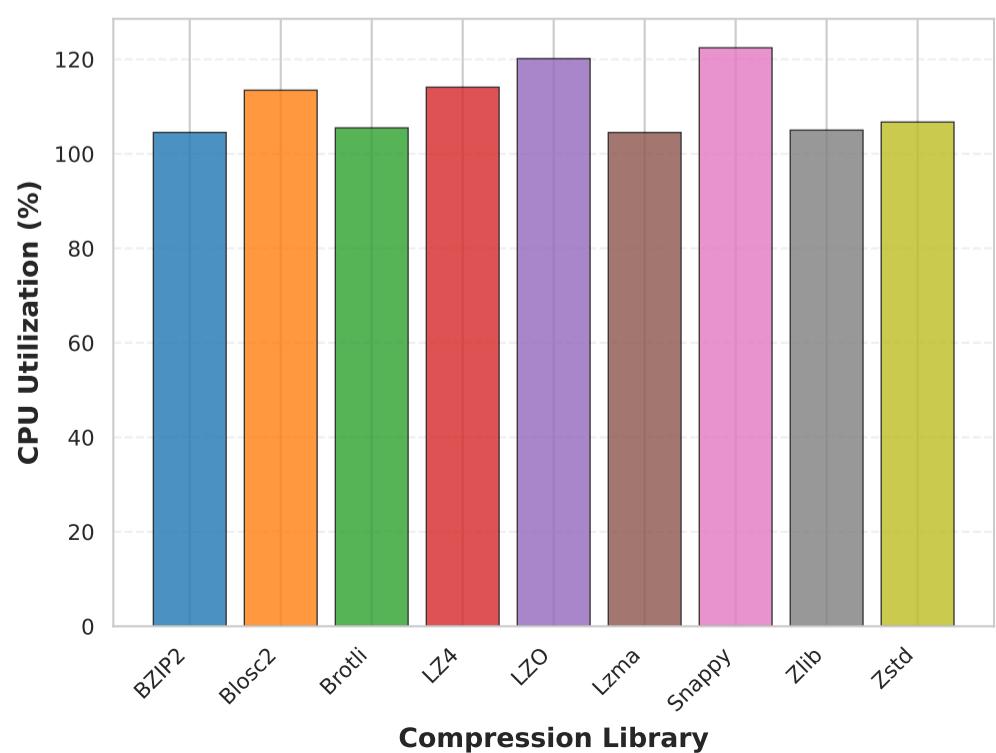
**Compression Time**

Decompression Time

Compression Ratio

Compression CPU Usage
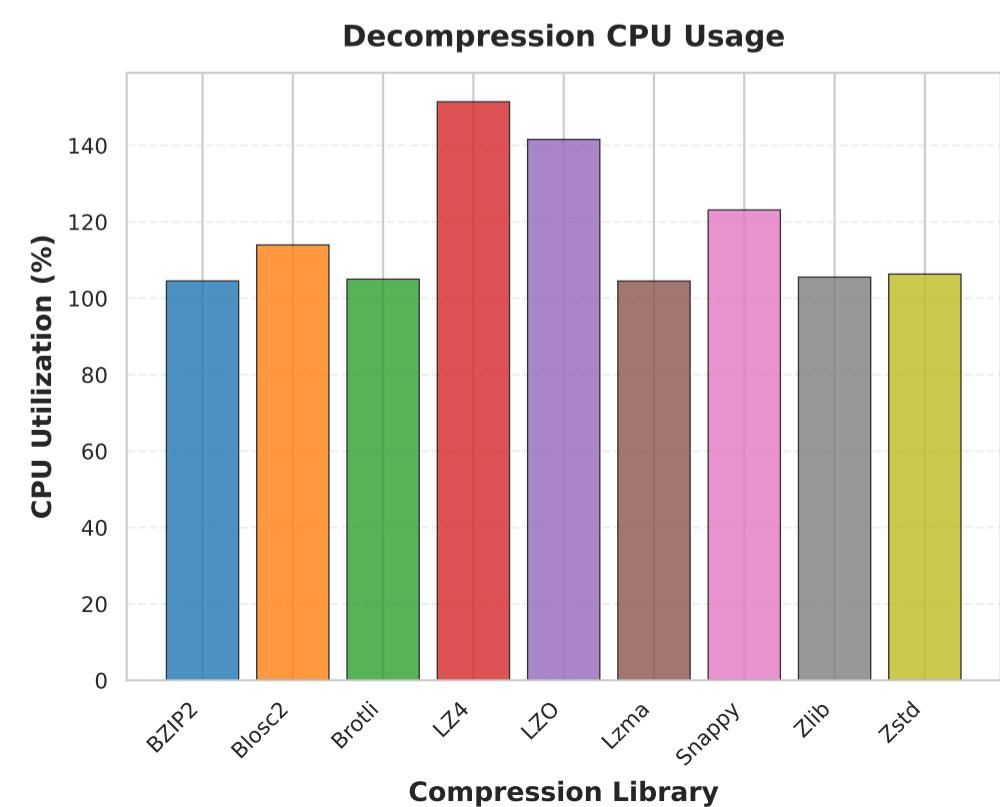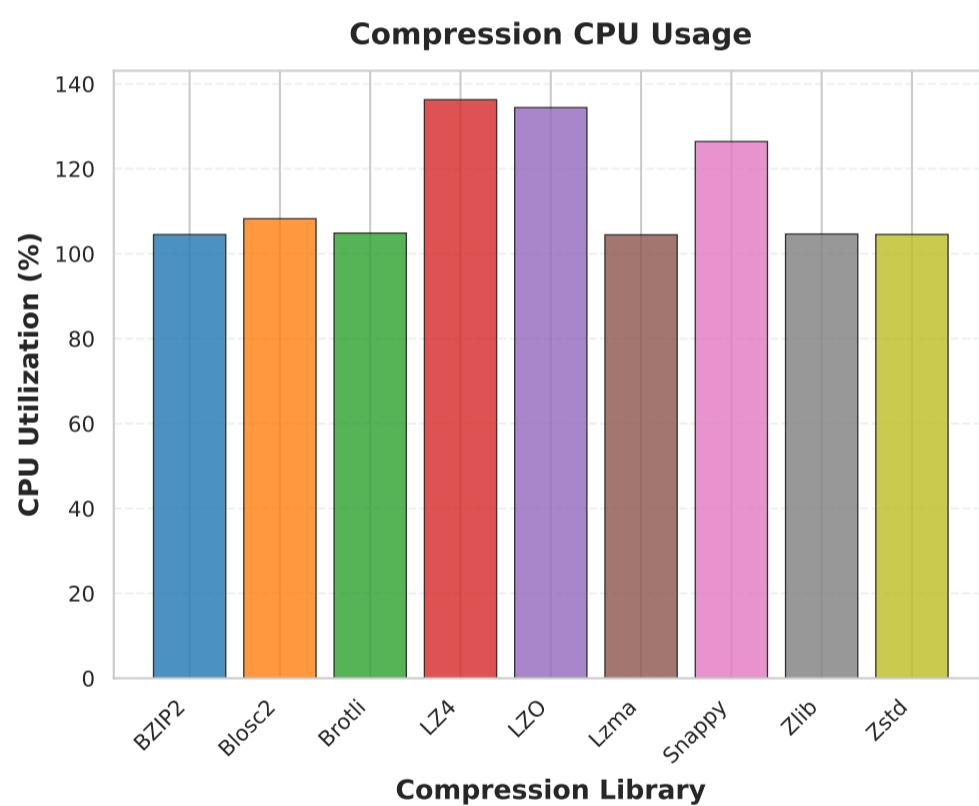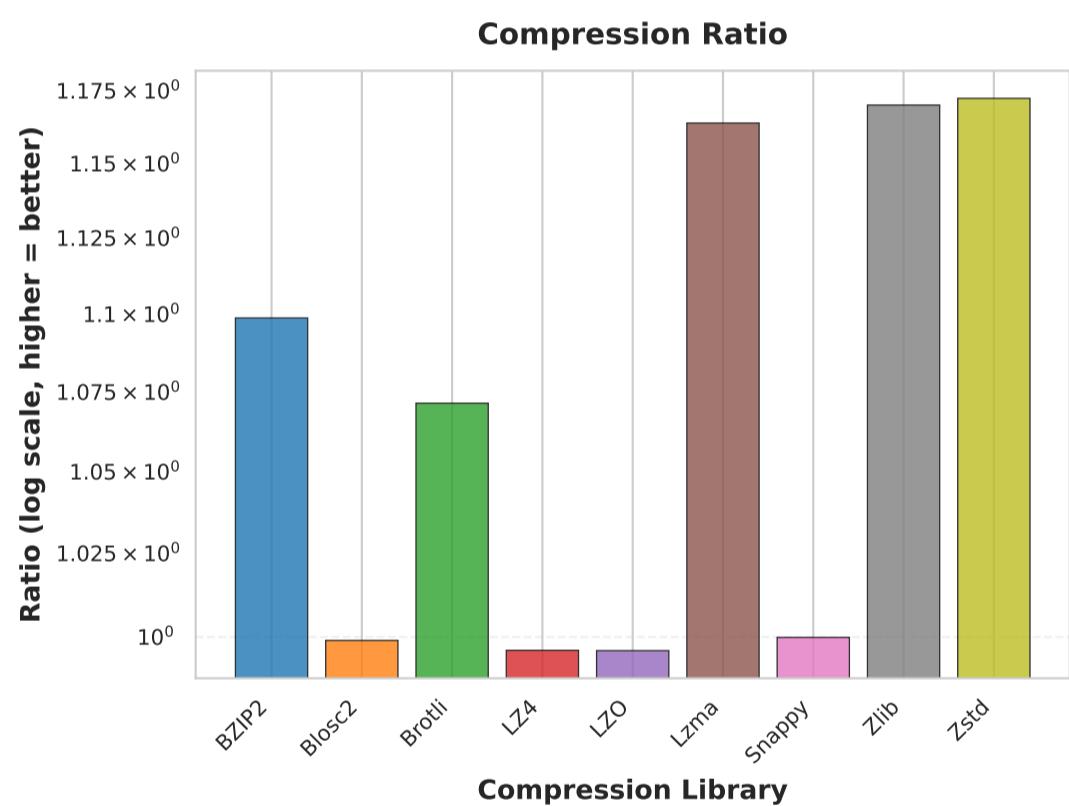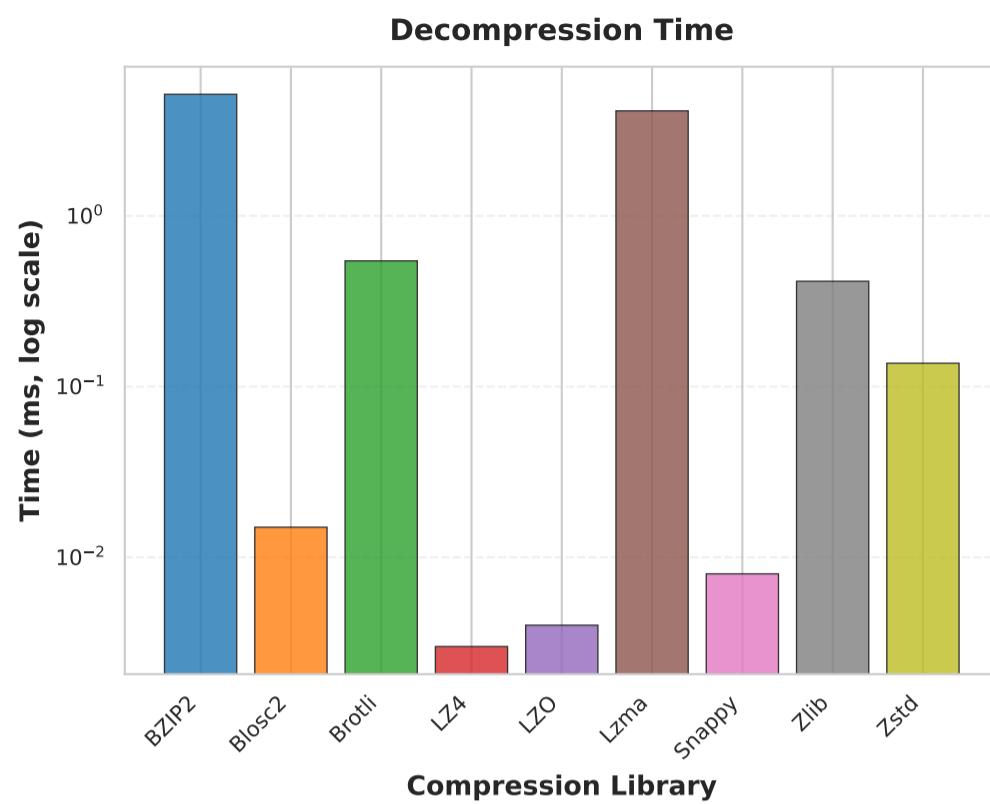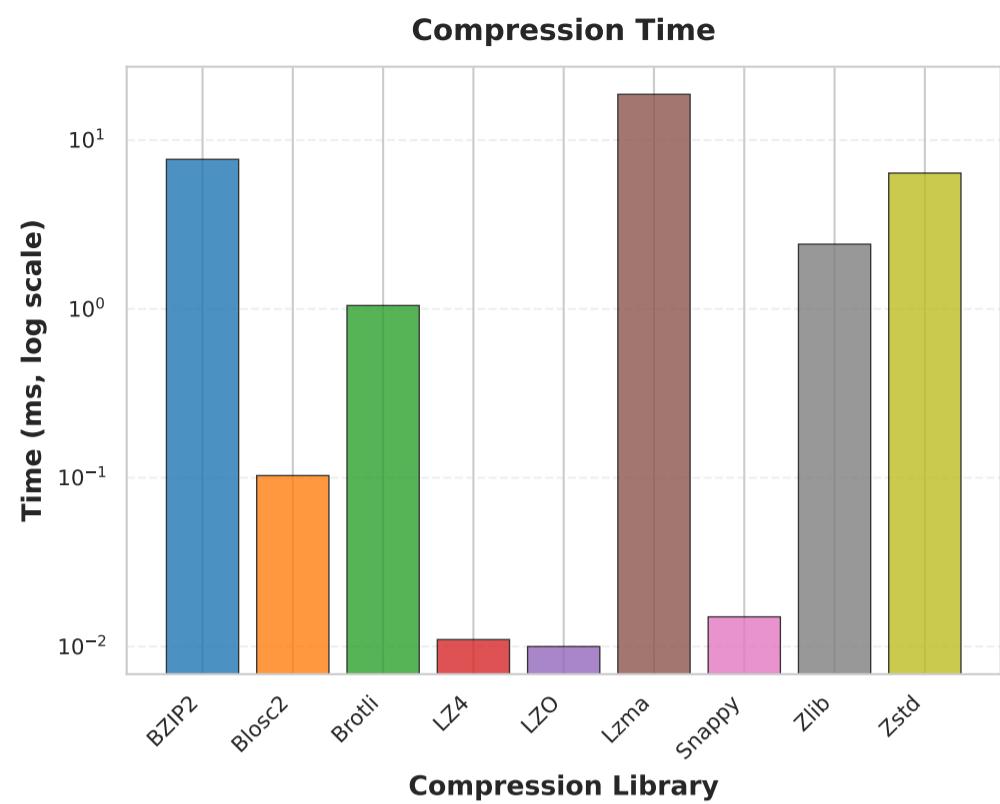
Decompression CPU Usage

Performance Summary (64KB chunks)
Sorted by Compression Ratio

Library	Ratio	Time (ms)	CPU%
Zstd	1.22x	8.5	105%
Lzma	1.20x	21.9	104%
Zlib	1.14x	5.0	105%
BZIP2	1.09x	8.3	105%
Brotli	1.07x	1.4	105%
LZ4	1.01x	0.2	108%
Snappy	1.00x	0.0	123%
Blosc2	1.00x	0.1	107%
LZO	1.00x	0.0	120%

Parameter Study: gamma_high
Gamma(α=1, β=2) × 20: Tight clustering at low values
Char Data Type, 64KB Chunk Size
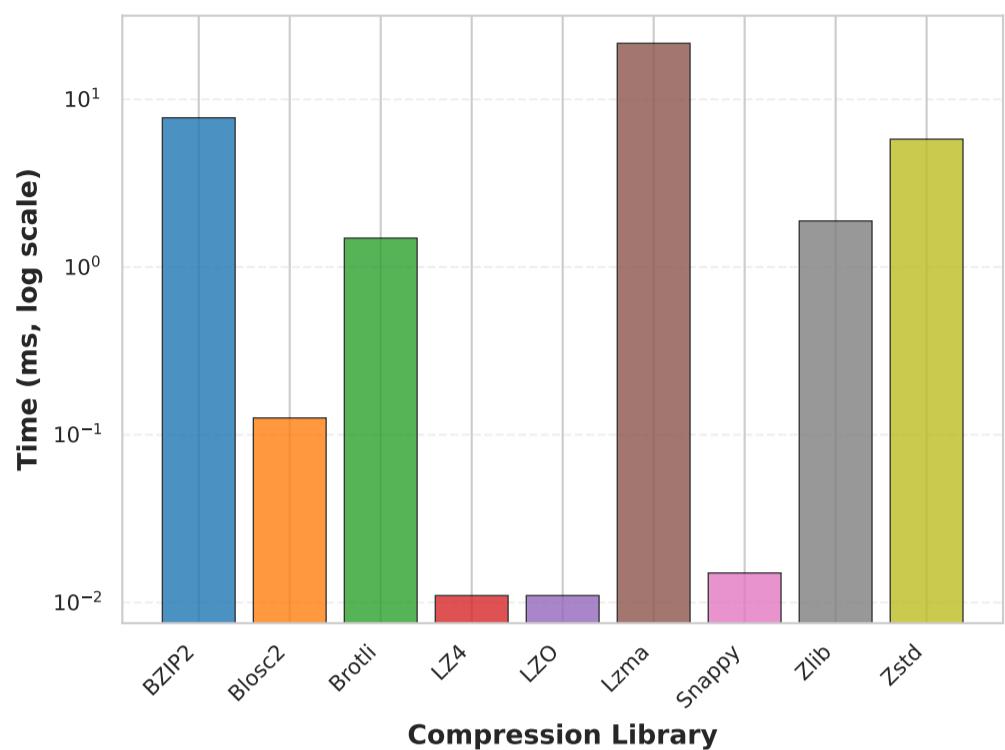
Compression Time

Decompression Time

Compression Ratio

Compression CPU Usage

Decompression CPU Usage

Performance Summary (64KB chunks)
Sorted by Compression Ratio
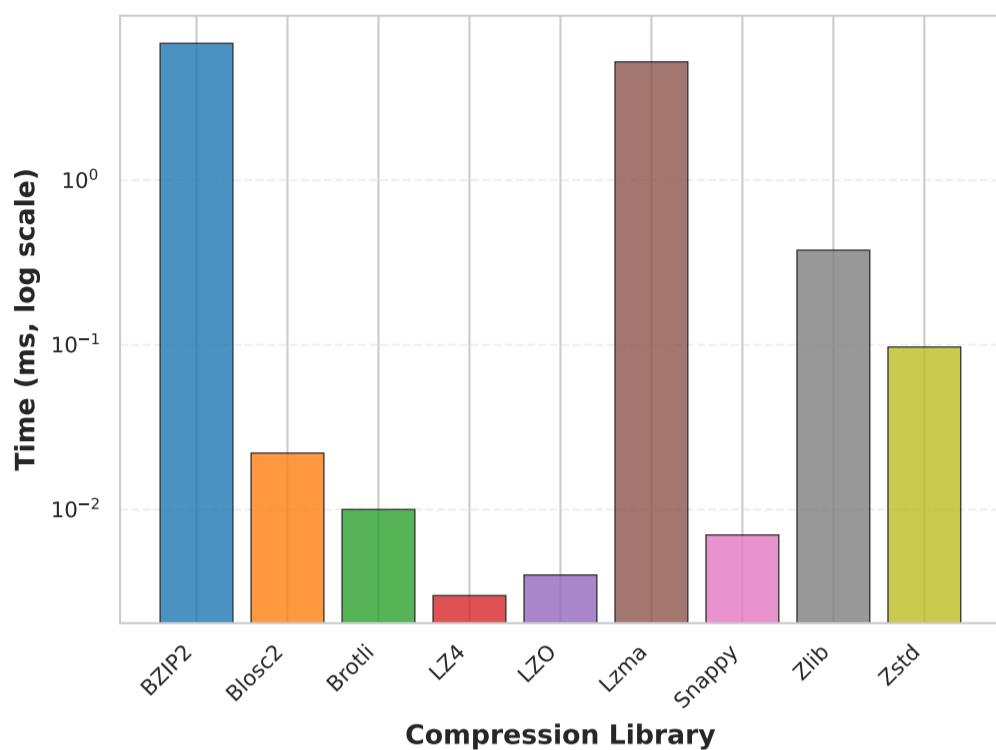
Library	Ratio	Time (ms)	CPU%
Zstd	1.17x	6.4	105%
Zlib	1.17x	2.4	105%
Lzma	1.16x	18.7	104%
BZIP2	1.10x	7.7	105%
Brotli	1.07x	1.0	105%
Snappy	1.00x	0.0	126%
Blosc2	1.00x	0.1	108%
LZ4	1.00x	0.0	136%
LZO	1.00x	0.0	134%

Parameter Study: gamma_incomp
Gamma(α=5, β=5) × 5 + noise: Wide spread, high entropy
Char Data Type, 64KB Chunk Size
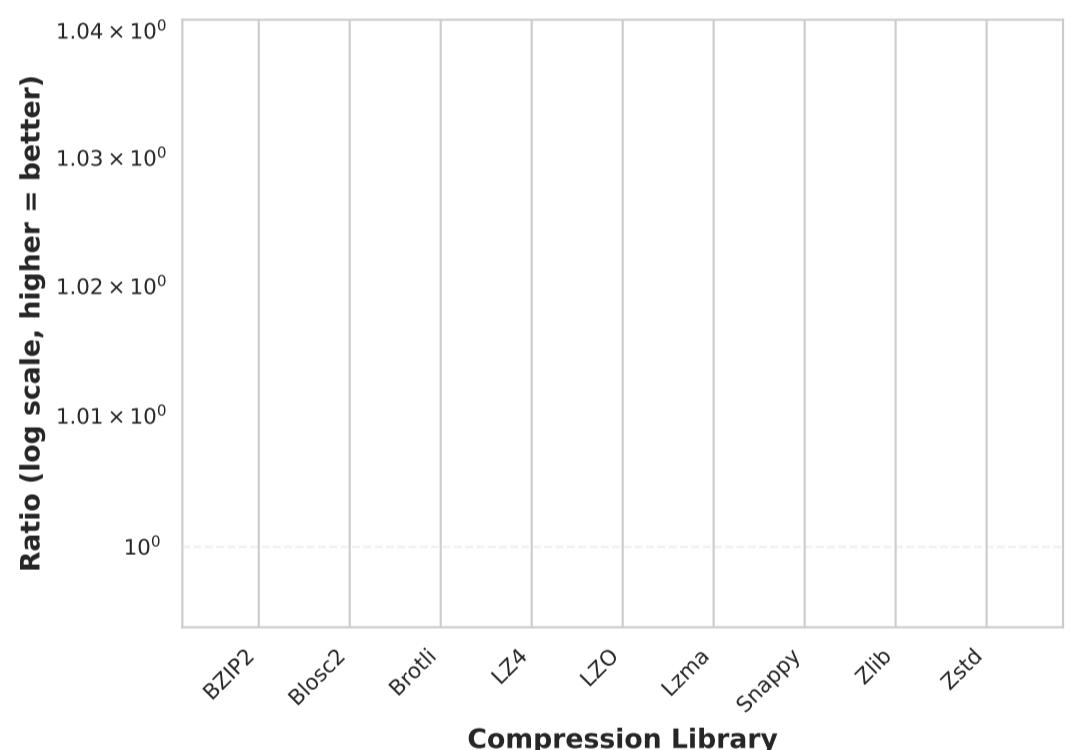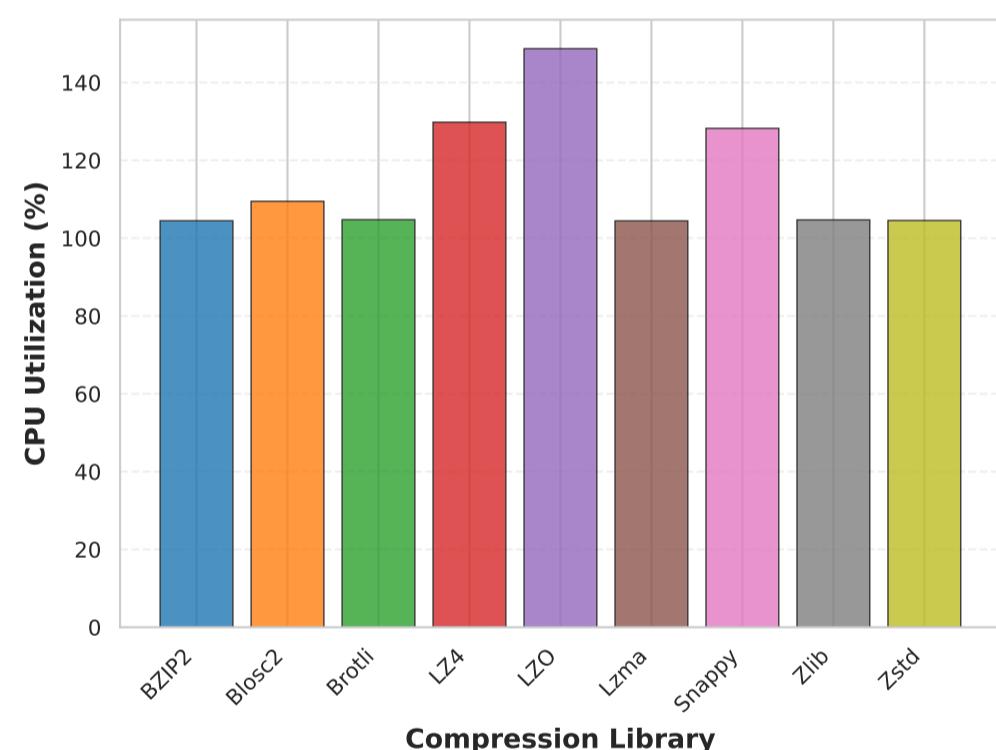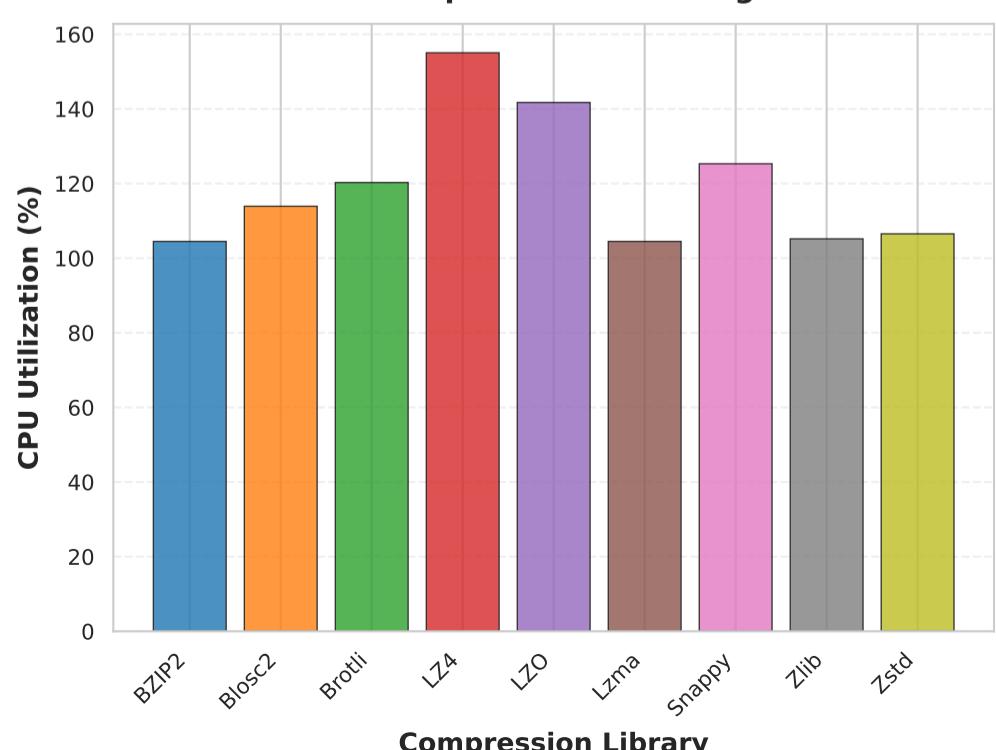
Compression Time

Decompression Time

Compression Ratio

**Compression CPU Usage**

Decompression CPU Usage
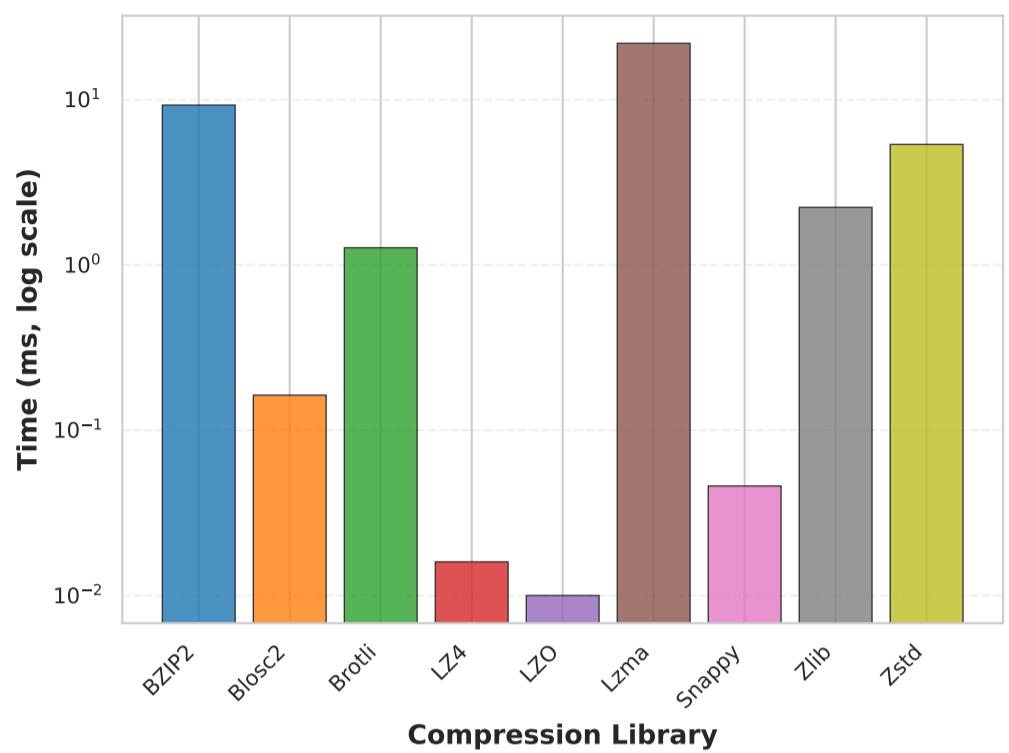
Performance Summary (64KB chunks)
Sorted by Compression Ratio
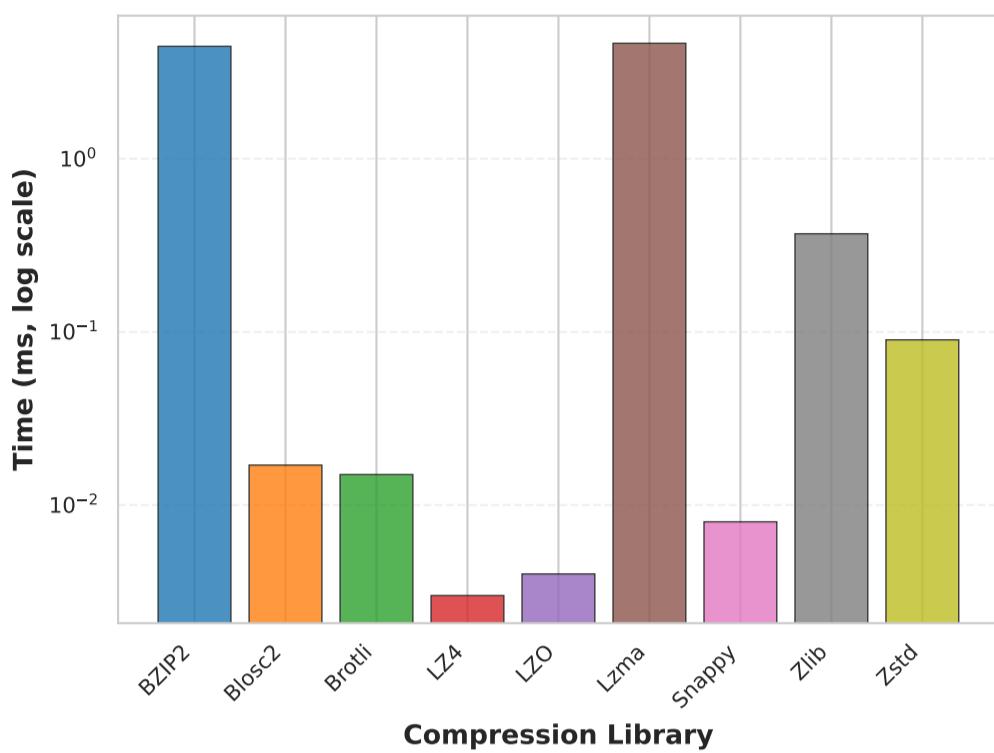
Library	Ratio	Time (ms)	CPU%
Zstd	1.04x	5.8	105%
Zlib	1.04x	1.9	105%
Lzma	1.03x	21.6	104%
BZIP2	1.00x	7.8	104%
Brotli	1.00x	1.5	105%
Snappy	1.00x	0.0	128%
Blosc2	1.00x	0.1	109%
LZ4	1.00x	0.0	130%
LZO	1.00x	0.0	149%

Parameter Study: gamma_light
Gamma(α=5, β=8) × 4: Moderate spread, some clustering
Char Data Type, 64KB Chunk Size
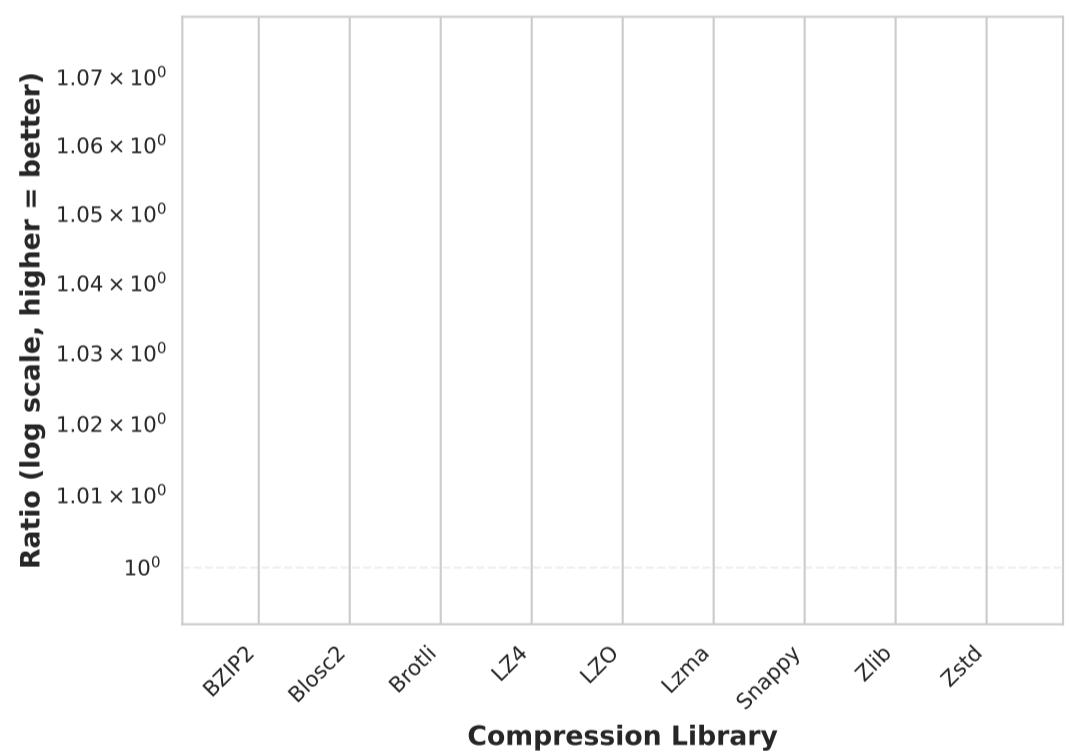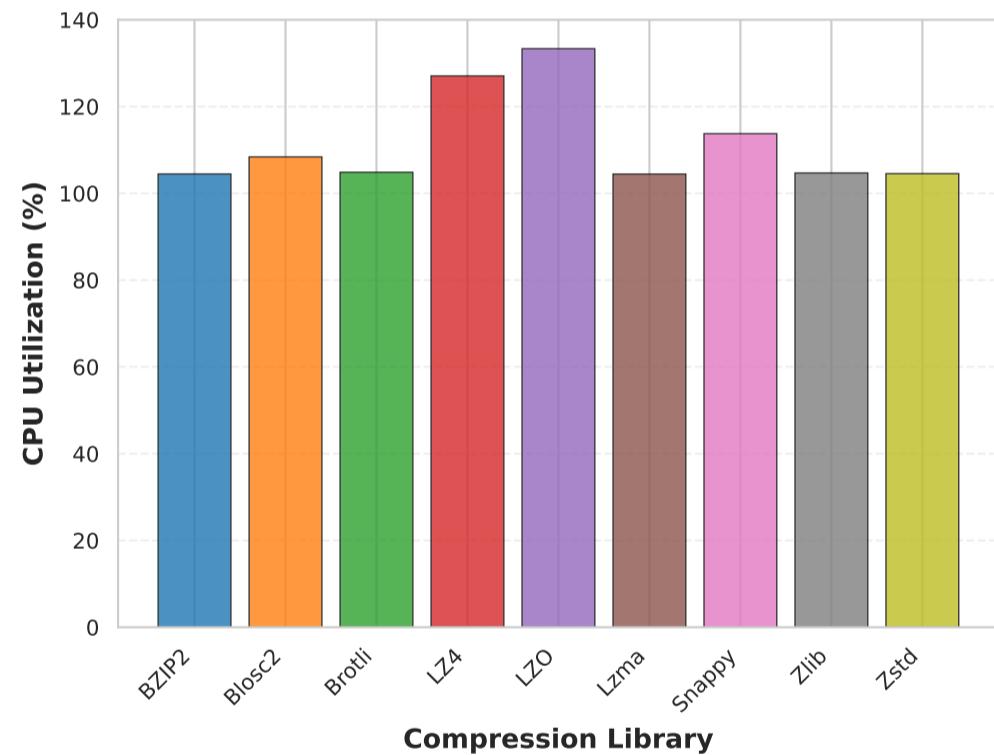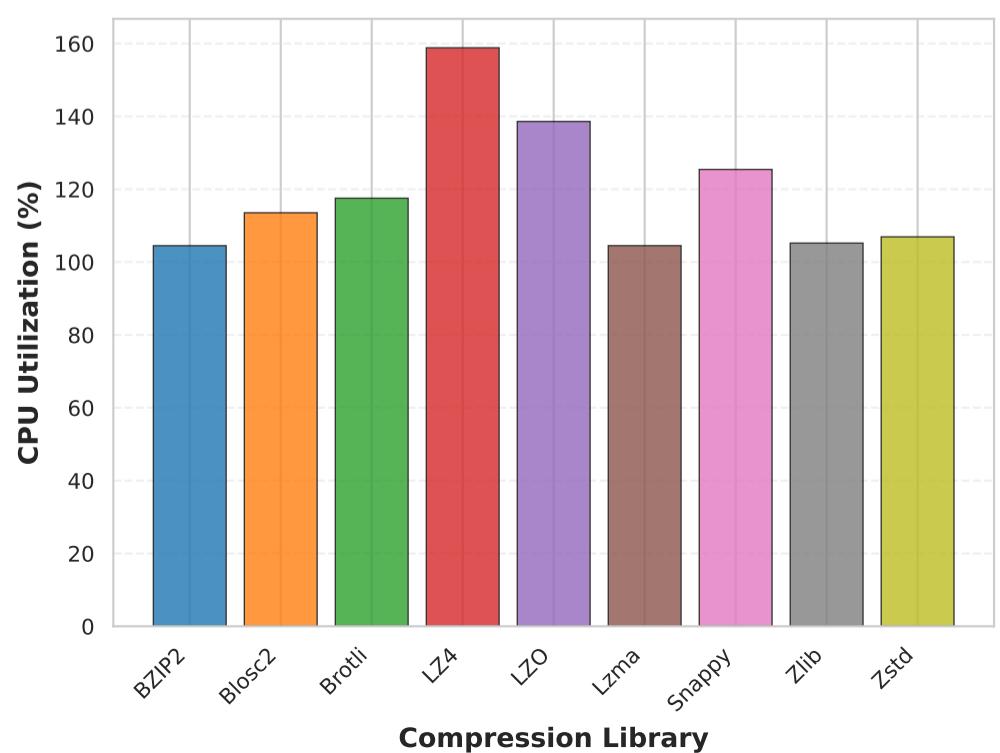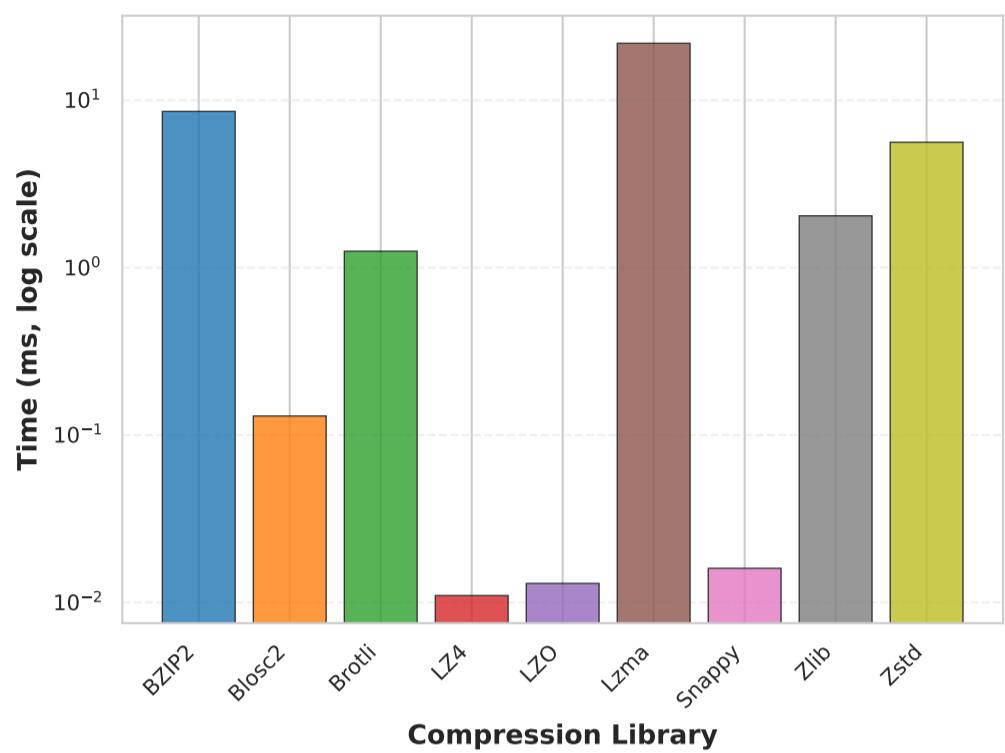
Performance Summary (64KB chunks)
Sorted by Compression Ratio
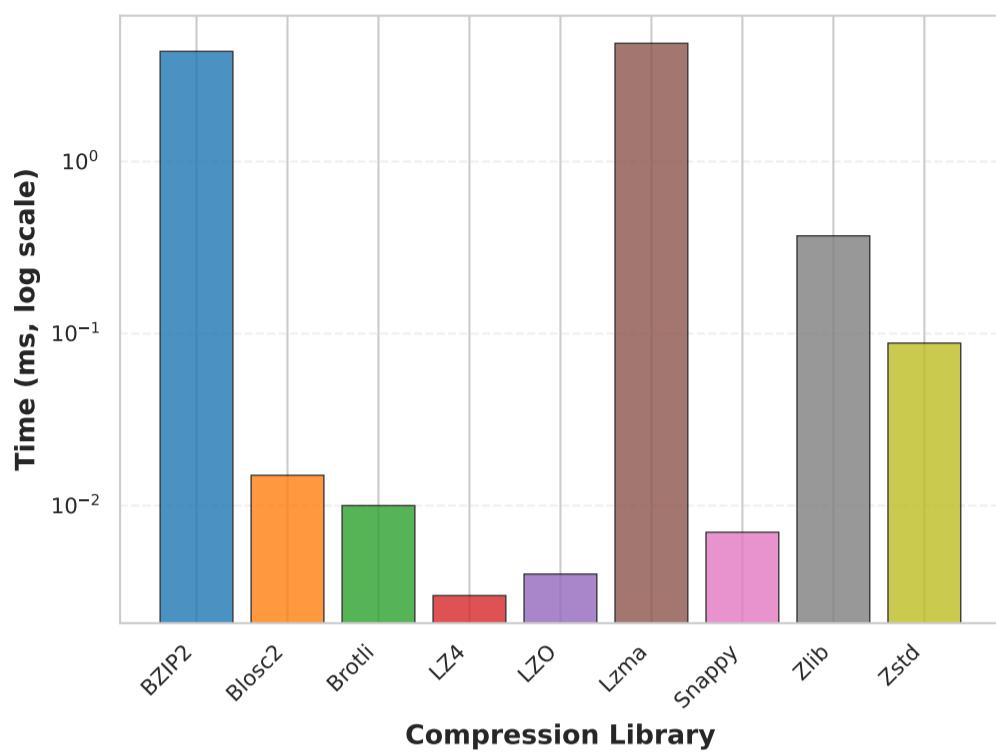
Library	Ratio	Time (ms)	CPU%
Zstd	1.07x	5.4	105%
Zlib	1.07x	2.2	105%
Lzma	1.06x	21.9	104%
BZIP2	1.02x	9.3	104%
Brotli	1.00x	1.3	105%
Snappy	1.00x	0.0	114%
Blosc2	1.00x	0.2	108%
LZ4	1.00x	0.0	127%
LZO	1.00x	0.0	133%

Parameter Study: gamma_medium
Gamma(α=2, β=4) × 15: Medium clustering
Char Data Type, 64KB Chunk Size
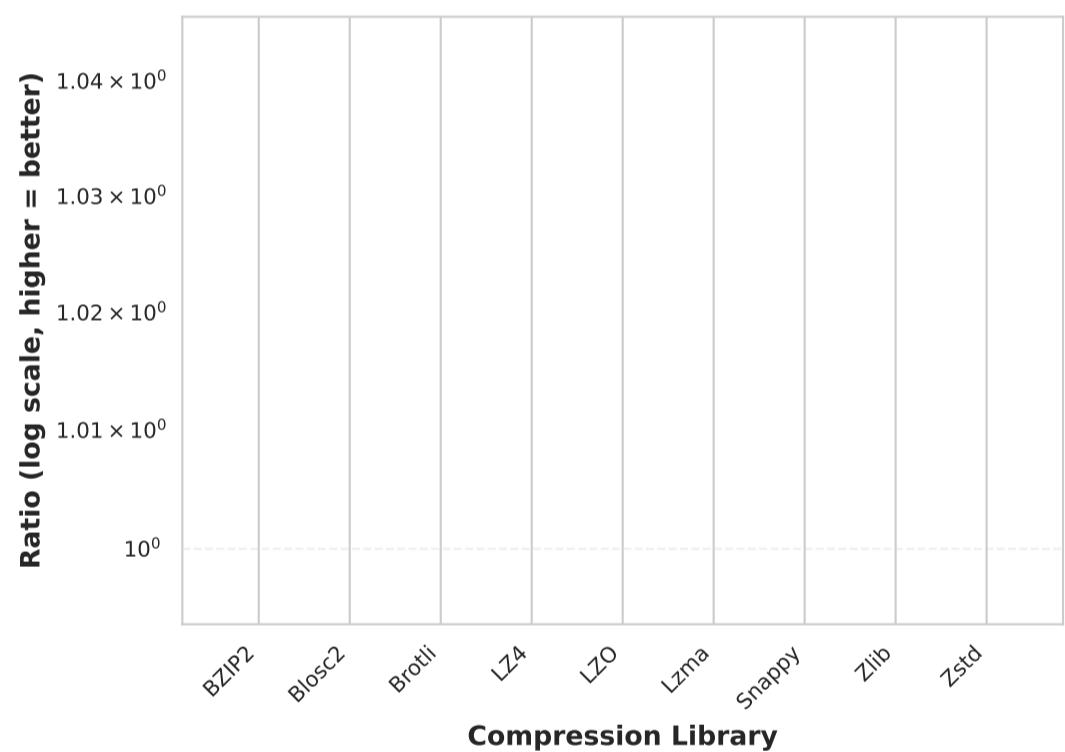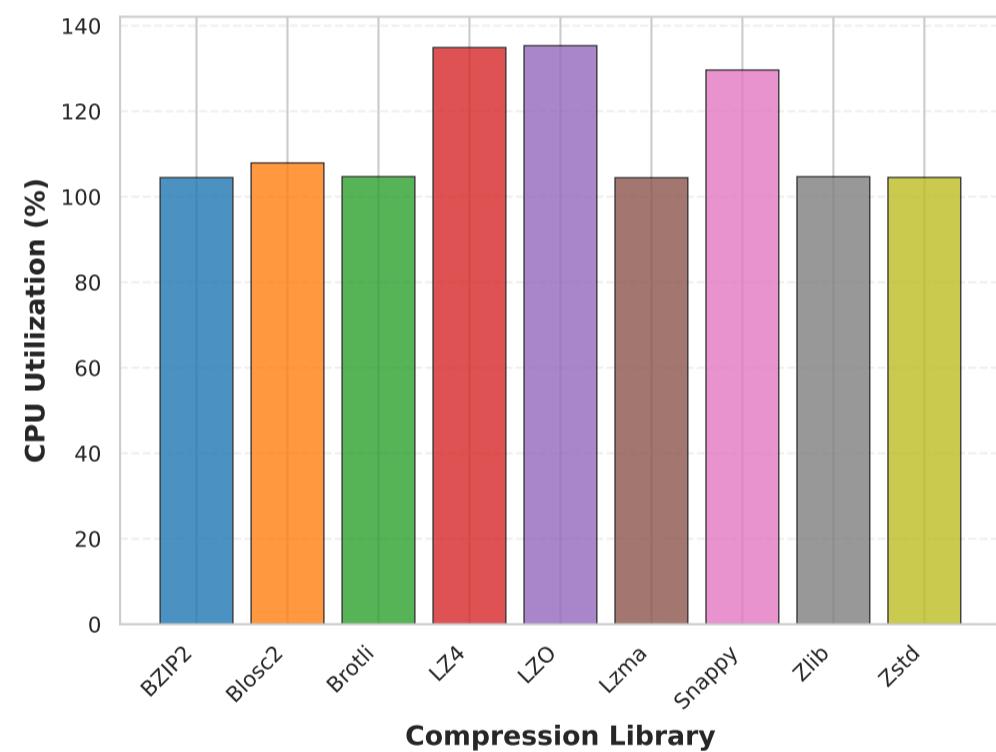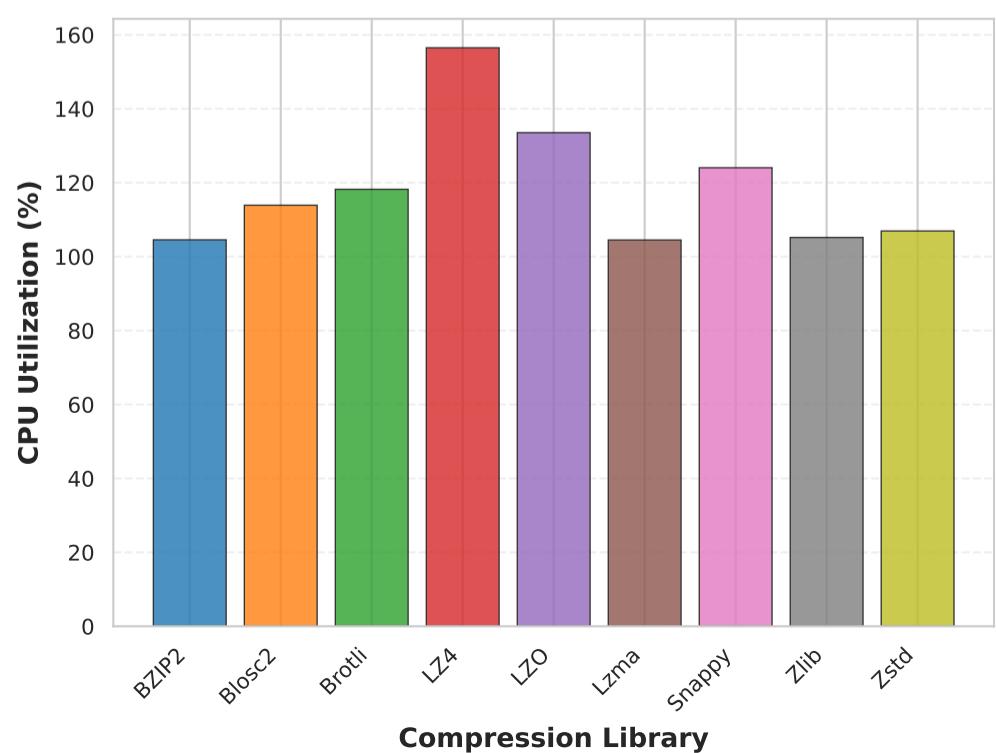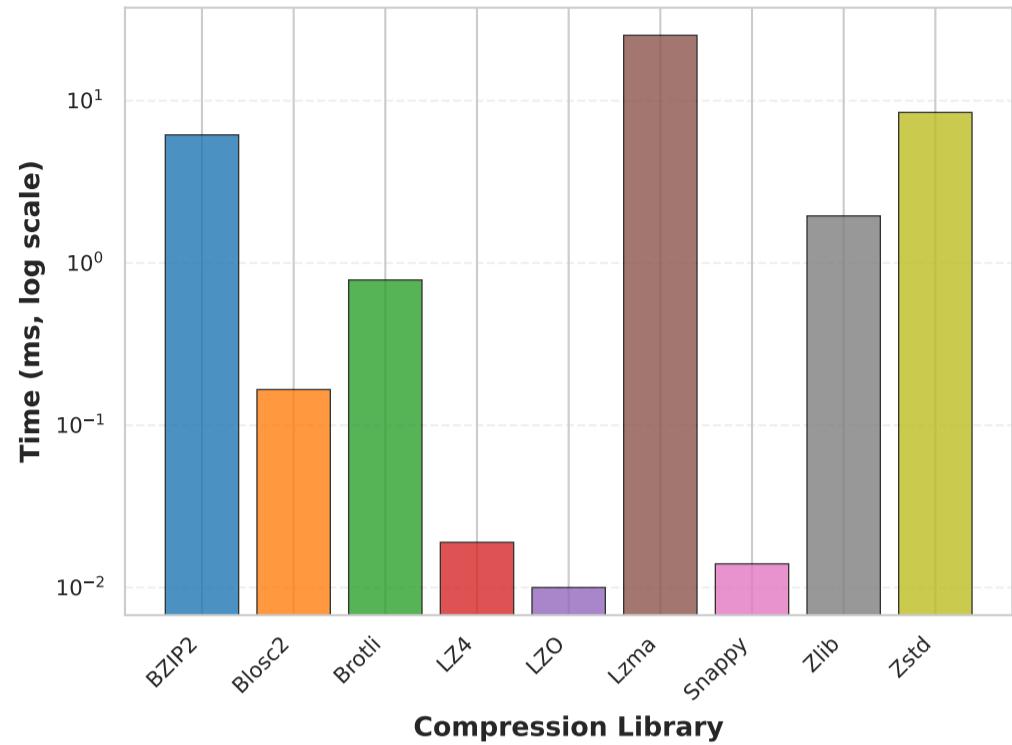
Performance Summary (64KB chunks)
Sorted by Compression Ratio
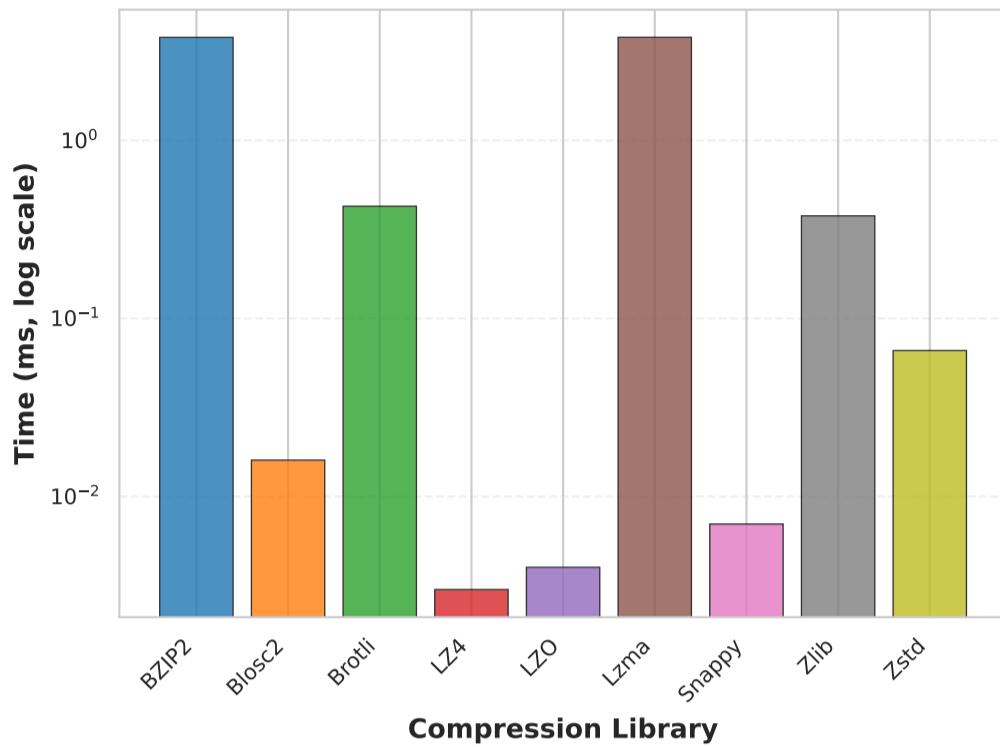
Library	Ratio	Time (ms)	CPU%
Zstd	1.04x	5.6	105%
Zlib	1.04x	2.0	105%
Lzma	1.03x	21.9	104%
BZIP2	1.00x	8.6	104%
Brotli	1.00x	1.3	105%
Snappy	1.00x	0.0	130%
Blosc2	1.00x	0.1	108%
LZ4	1.00x	0.0	135%
LZO	1.00x	0.0	135%

Parameter Study: normal_10
Standard deviation σ = 10 (controls clustering)
Char Data Type, 64KB Chunk Size
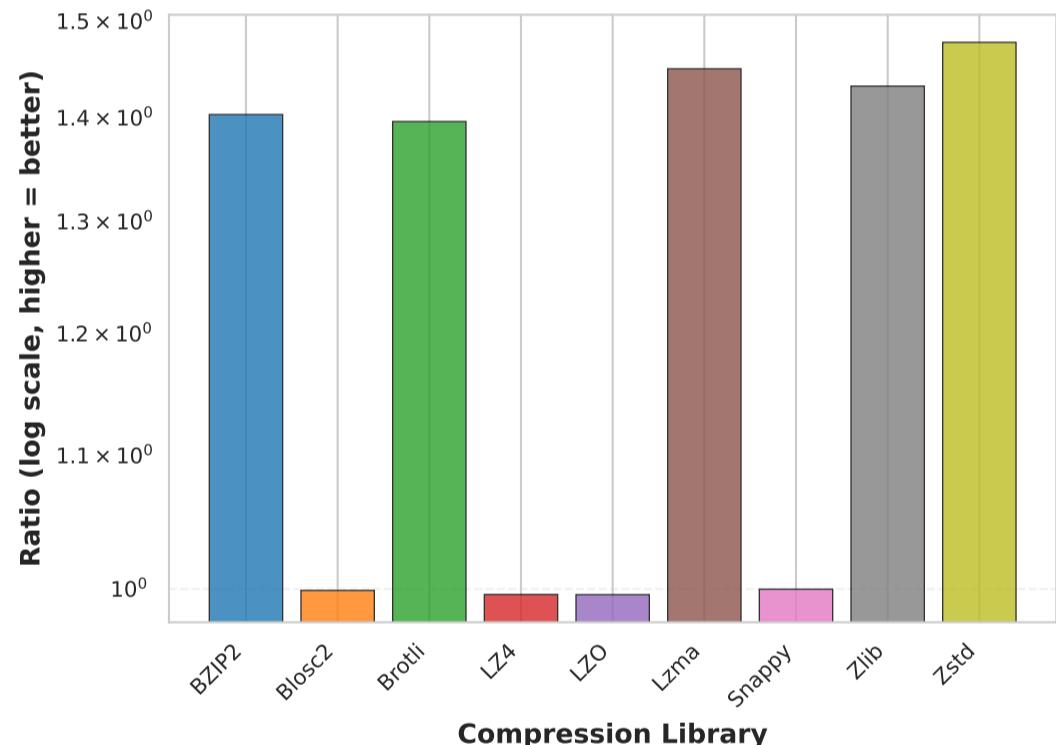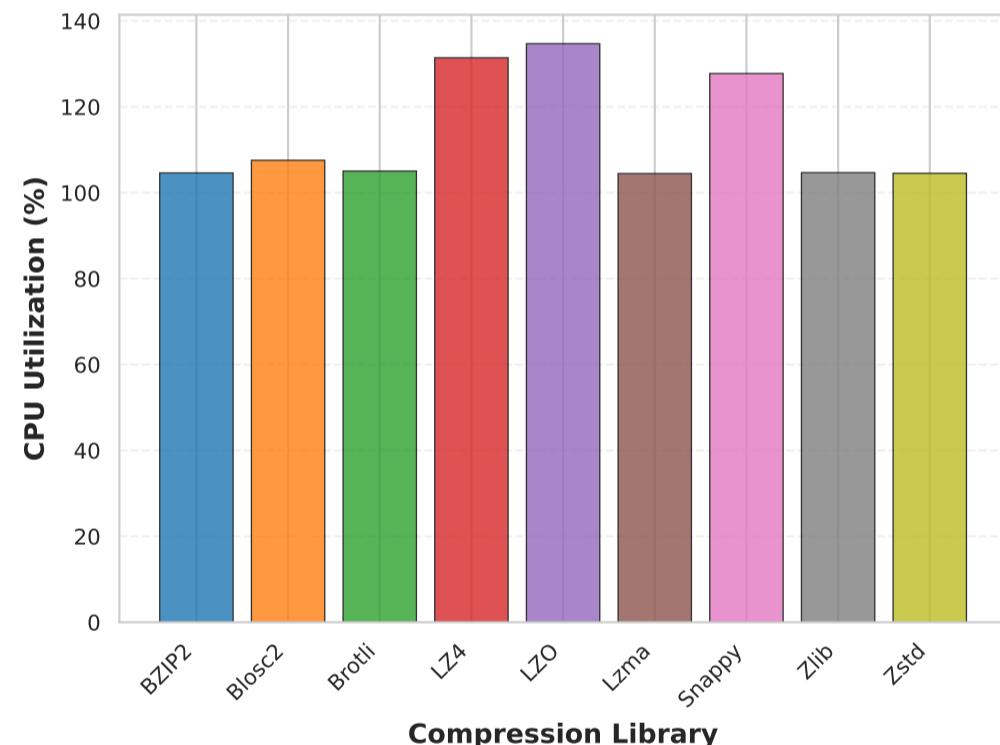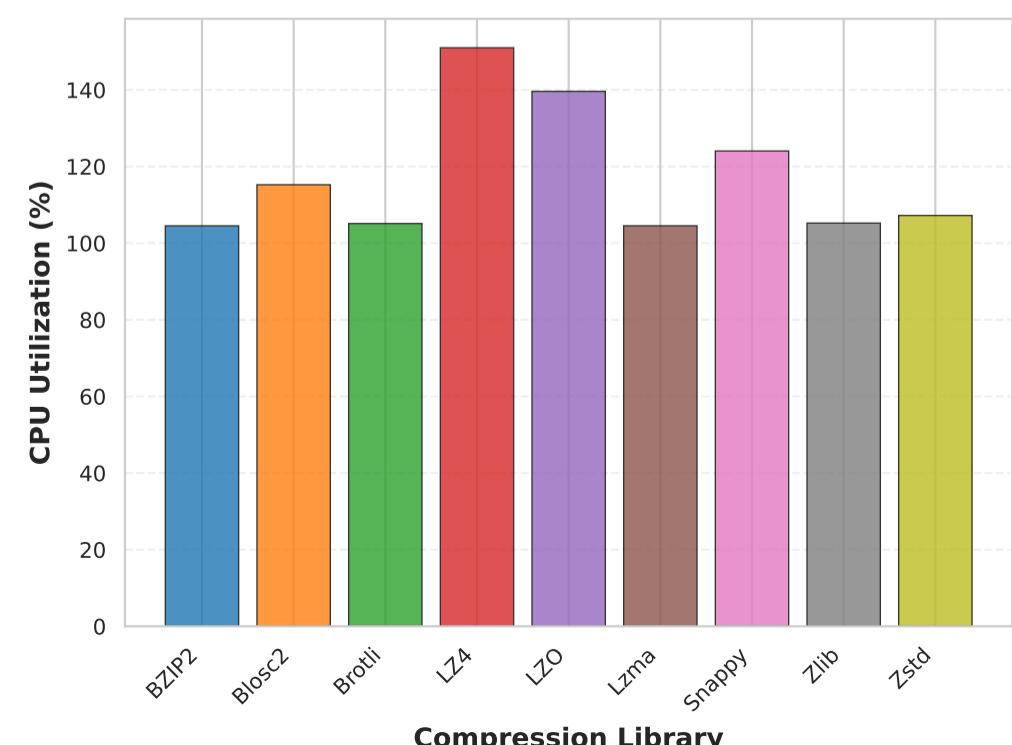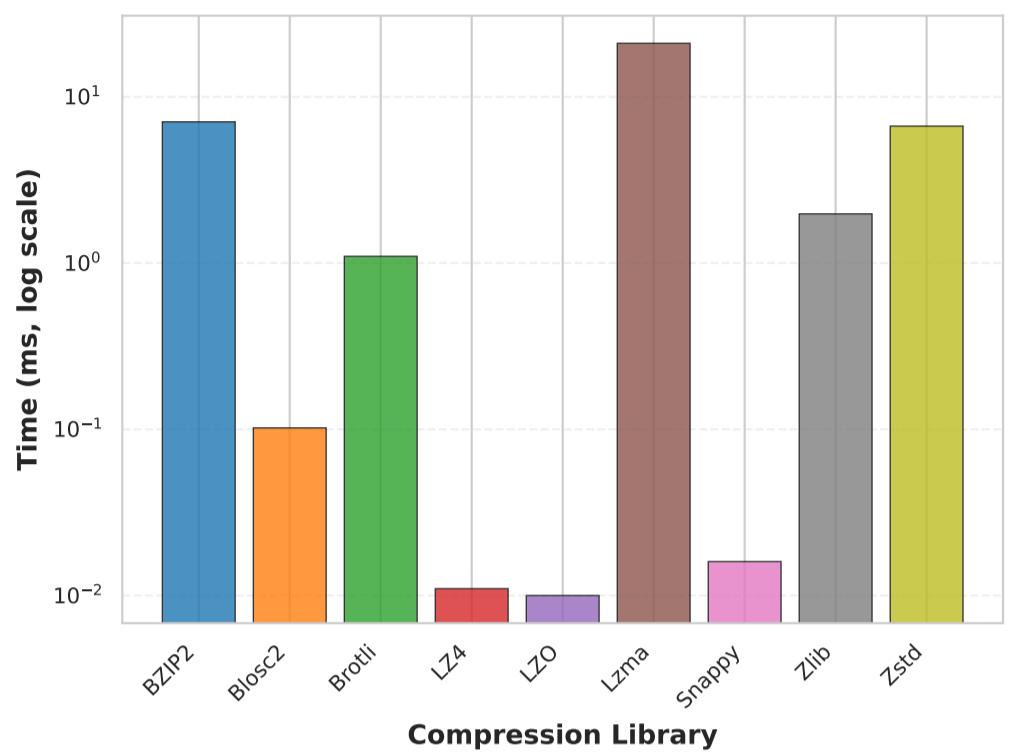
Performance Summary (64KB chunks)
Sorted by Compression Ratio
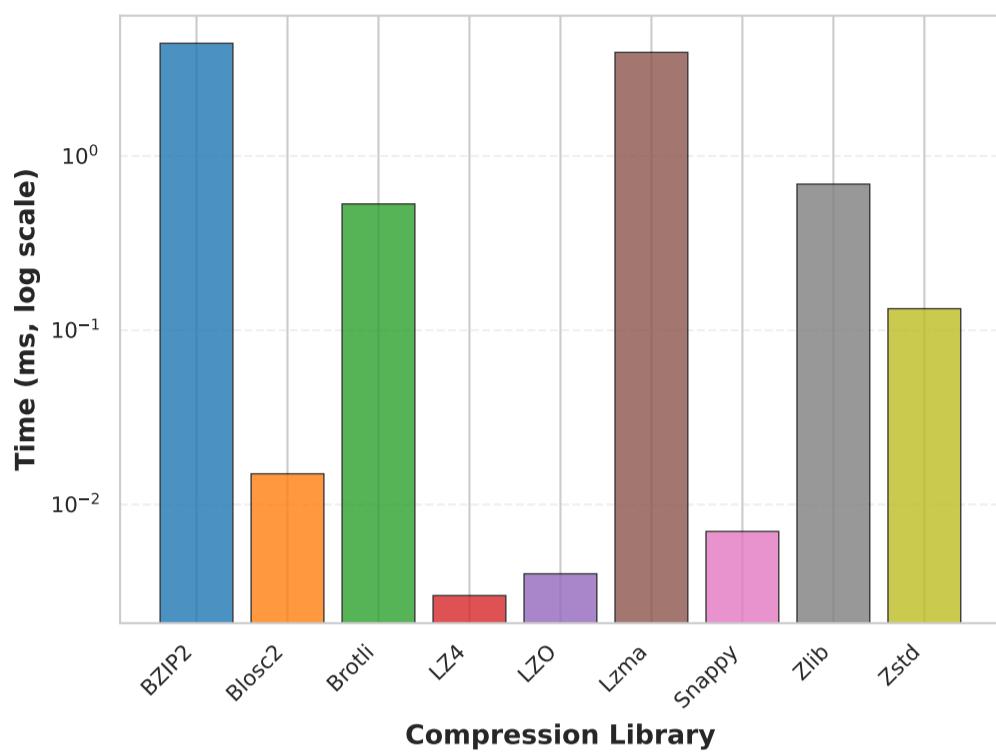
Library	Ratio	Time (ms)	CPU%
Zstd	1.48x	8.5	105%
Lzma	1.45x	25.3	104%
Zlib	1.43x	2.0	105%
BZIP2	1.40x	6.2	105%
Brotli	1.40x	0.8	105%
Snappy	1.00x	0.0	128%
Blosc2	1.00x	0.2	108%
LZ4	1.00x	0.0	131%
LZO	1.00x	0.0	135%

Parameter Study: normal_20
Standard deviation σ = 20 (controls clustering)
Char Data Type, 64KB Chunk Size
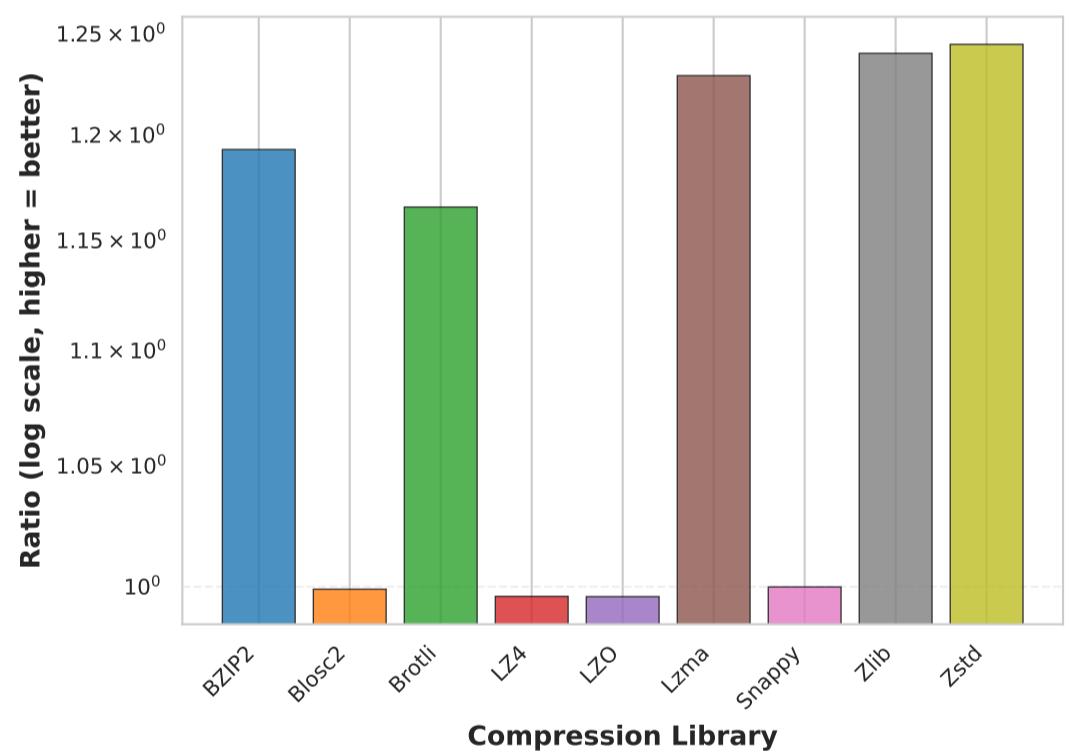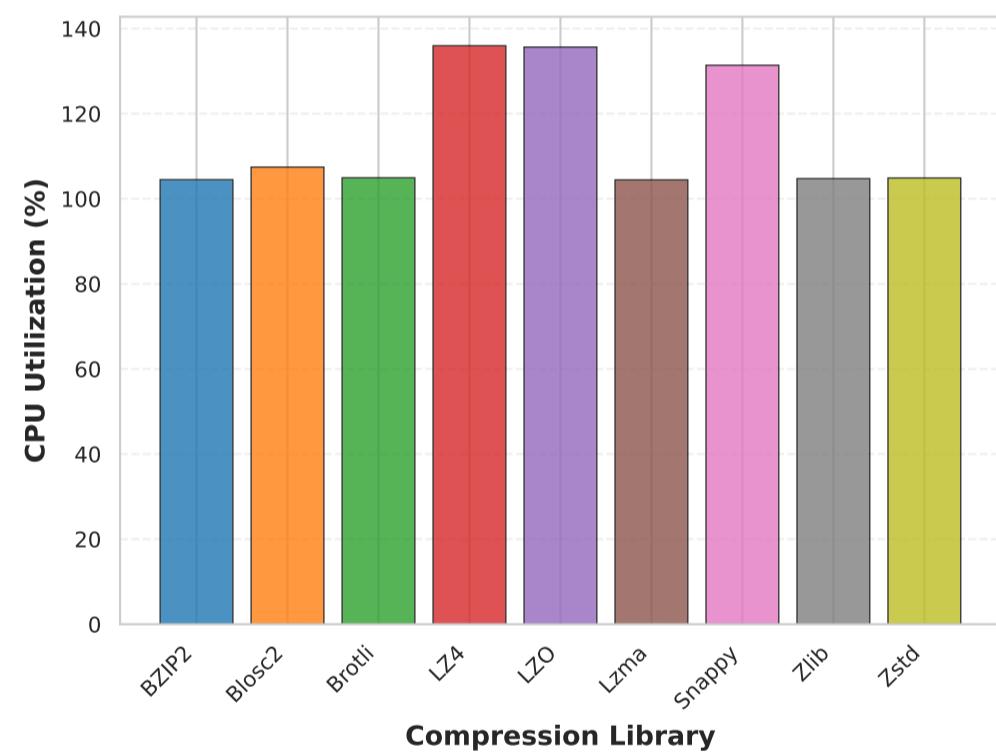
Compression Time

Decompression Time
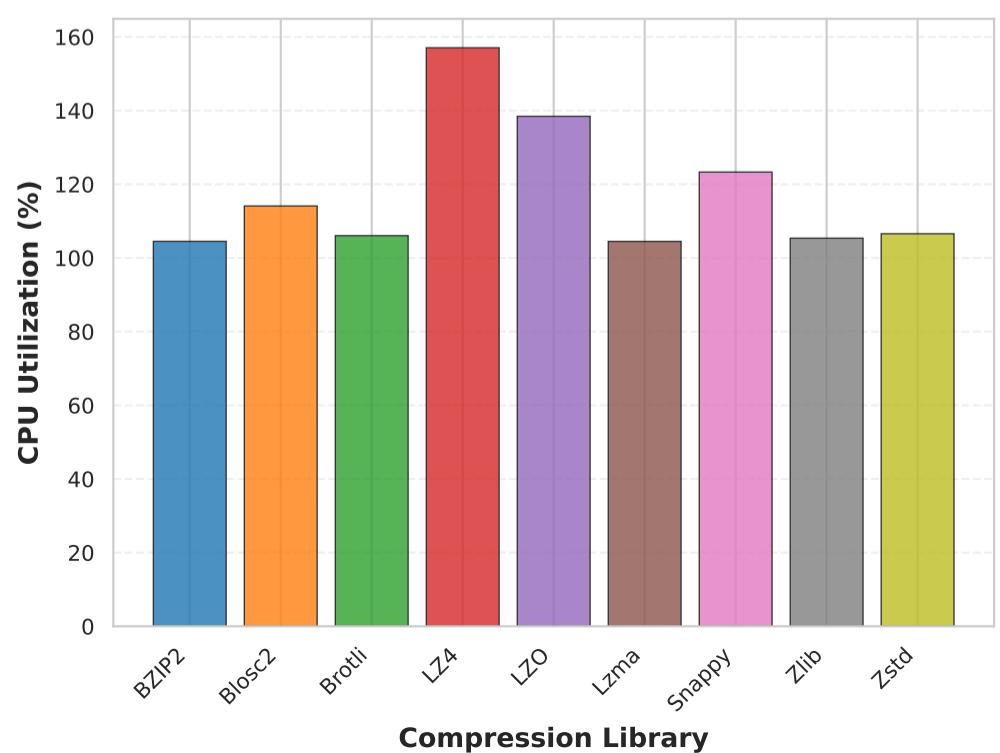
Compression Ratio

Compression CPU Usage

Decompression CPU Usage
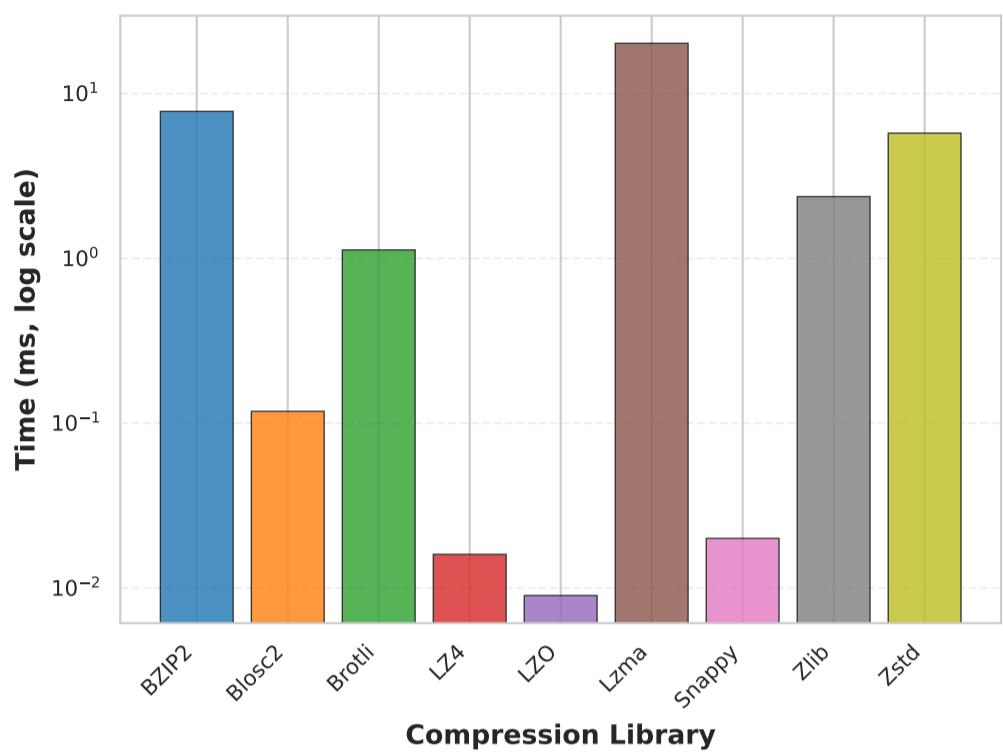
**Performance Summary (64KB chunks)**
Sorted by Compression Ratio
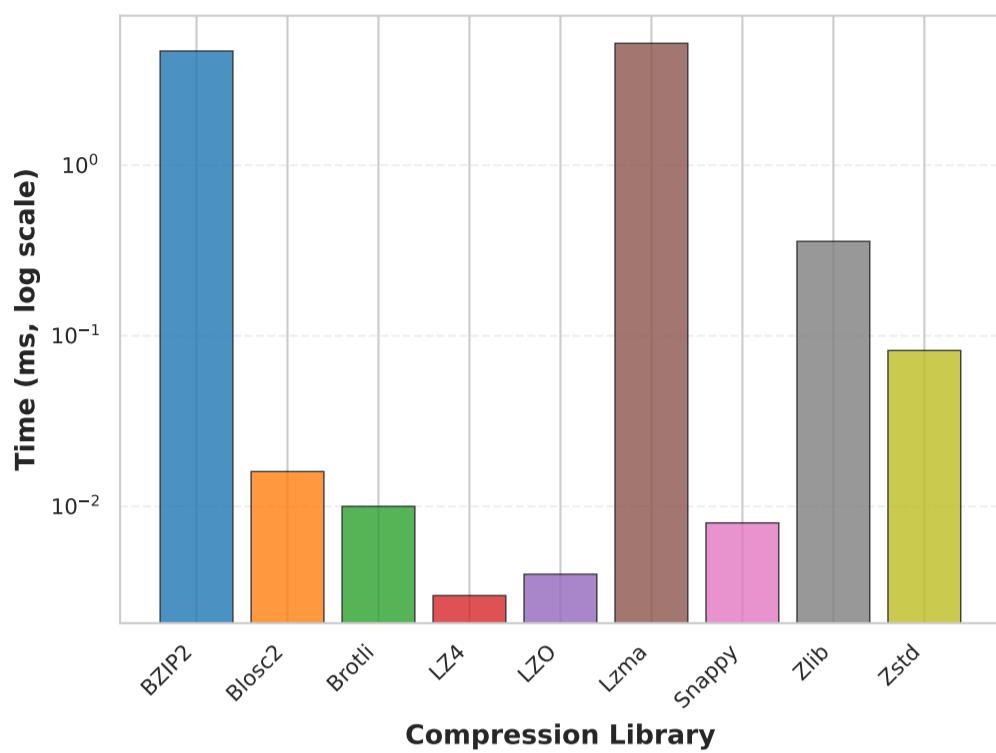
Library	Ratio	Time (ms)	CPU%
Zstd	1.24x	6.7	105%
Zlib	1.24x	2.0	105%
Lzma	1.23x	21.0	104%
BZIP2	1.19x	7.1	104%
Brotli	1.17x	1.1	105%
Snappy	1.00x	0.0	131%
Blosc2	1.00x	0.1	107%
LZ4	1.00x	0.0	136%
LZO	1.00x	0.0	136%

Parameter Study: normal_40
Standard deviation σ = 40 (controls clustering)
Char Data Type, 64KB Chunk Size
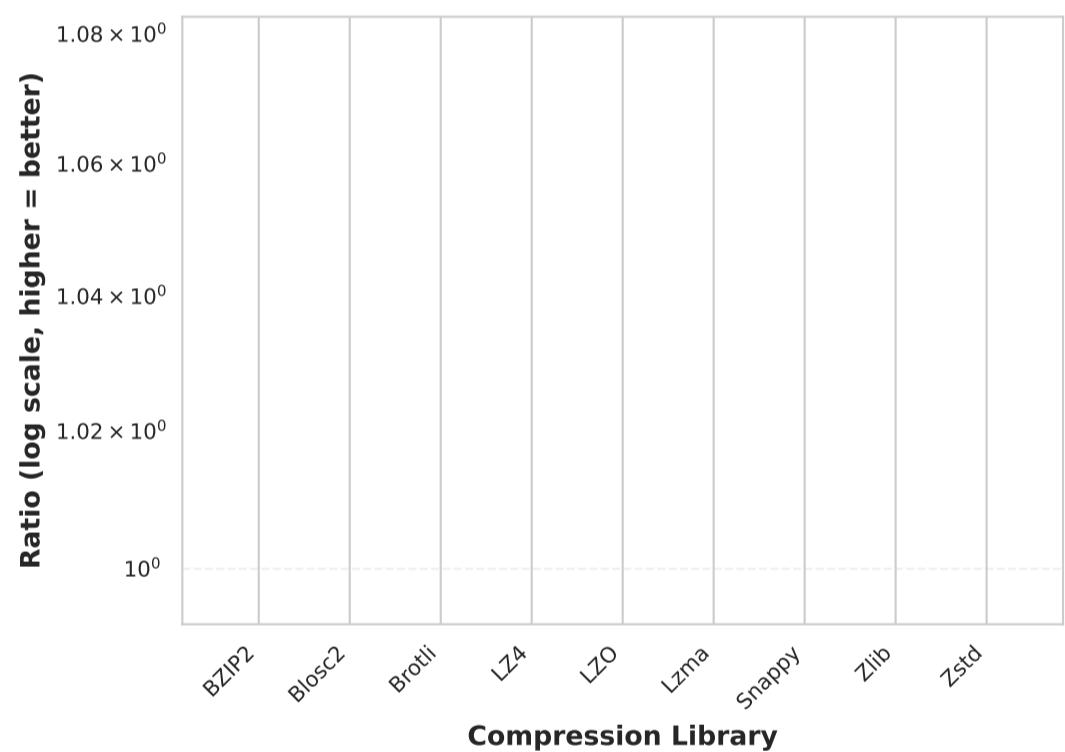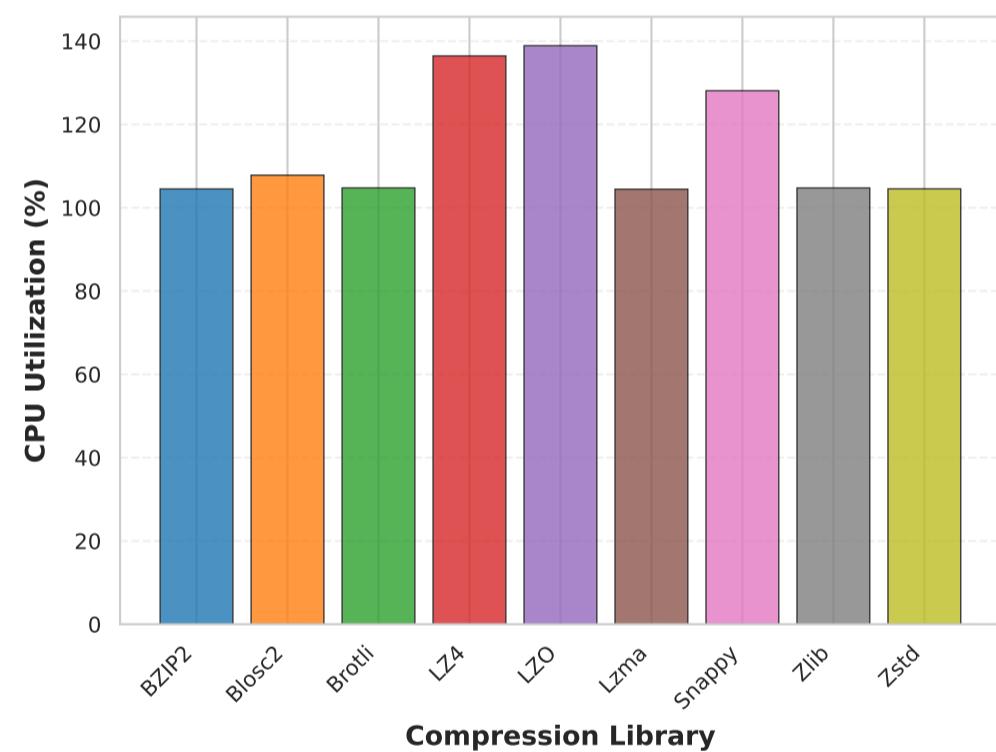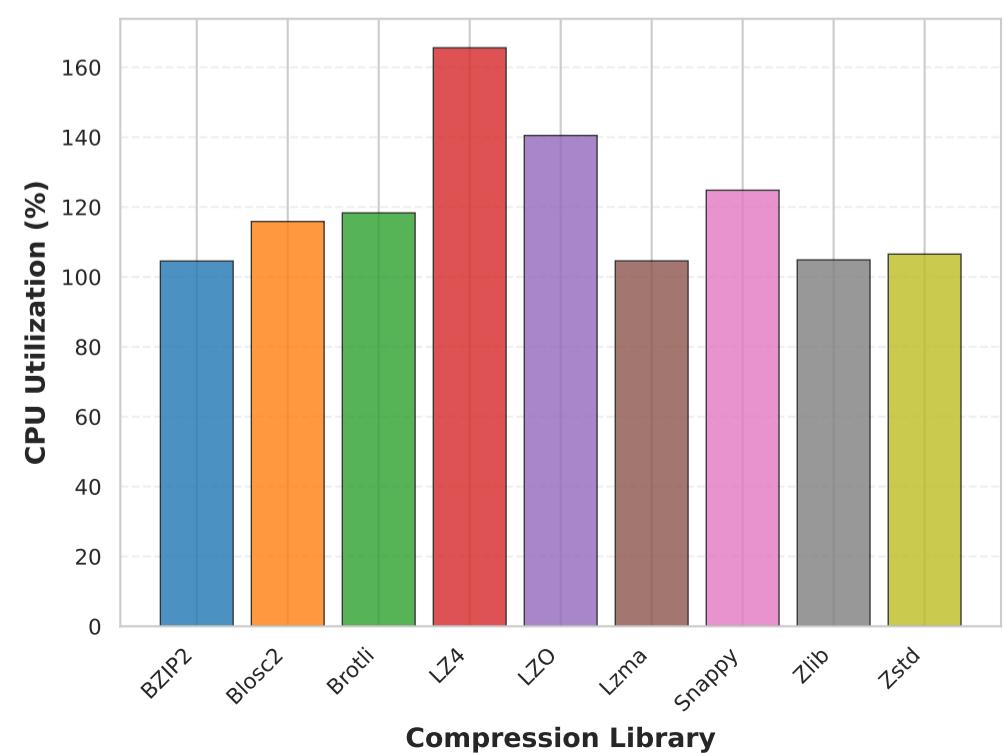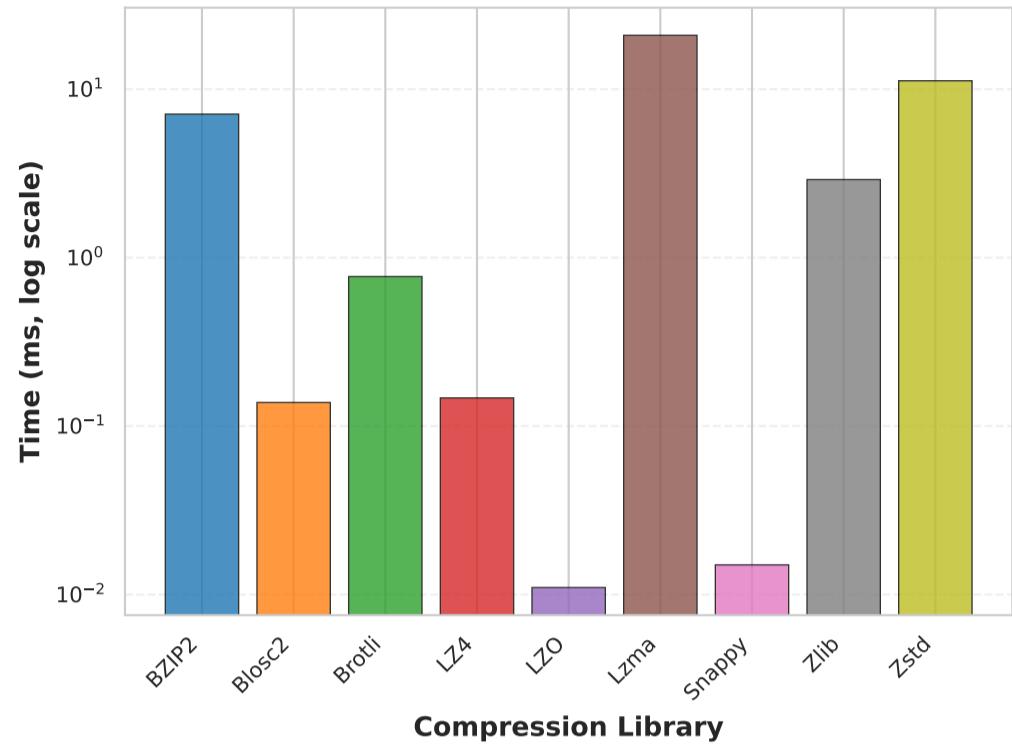
Performance Summary (64KB chunks)
Sorted by Compression Ratio
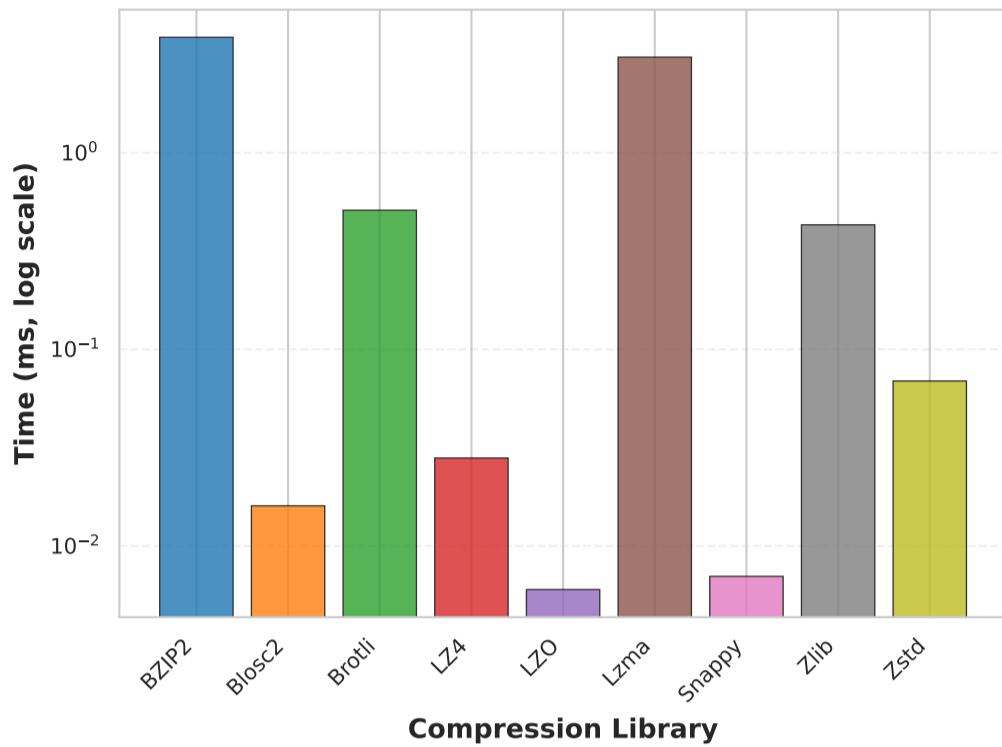
Library	Ratio	Time (ms)	CPU%
Zstd	1.08x	5.8	105%
Zlib	1.08x	2.4	105%
Lzma	1.07x	20.2	104%
BZIP2	1.04x	7.8	105%
Brotli	1.00x	1.1	105%
Snappy	1.00x	0.0	128%
Blosc2	1.00x	0.1	108%
LZ4	1.00x	0.0	136%
LZO	1.00x	0.0	139%

Parameter Study: normal_5
Standard deviation σ = 5 (controls clustering)
Char Data Type, 64KB Chunk Size
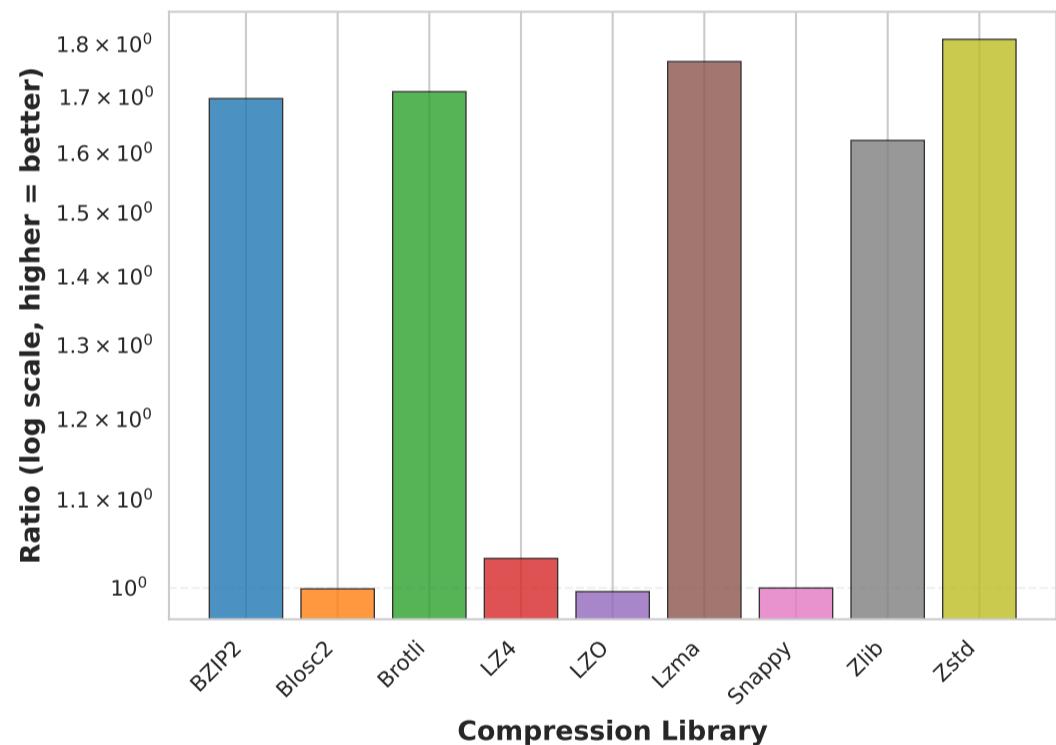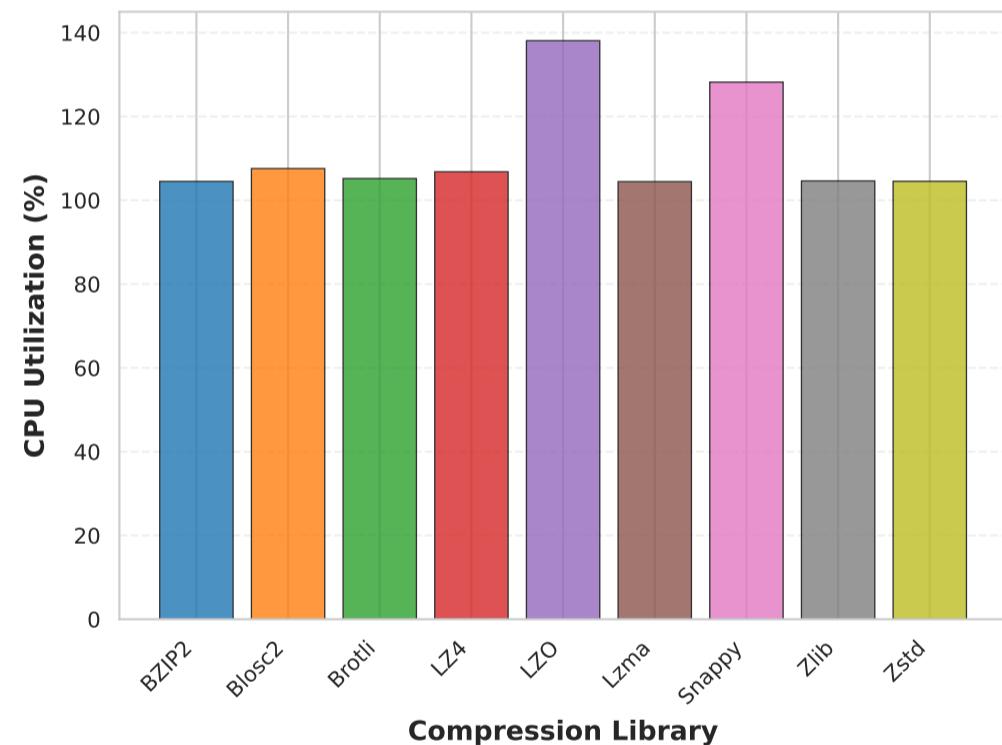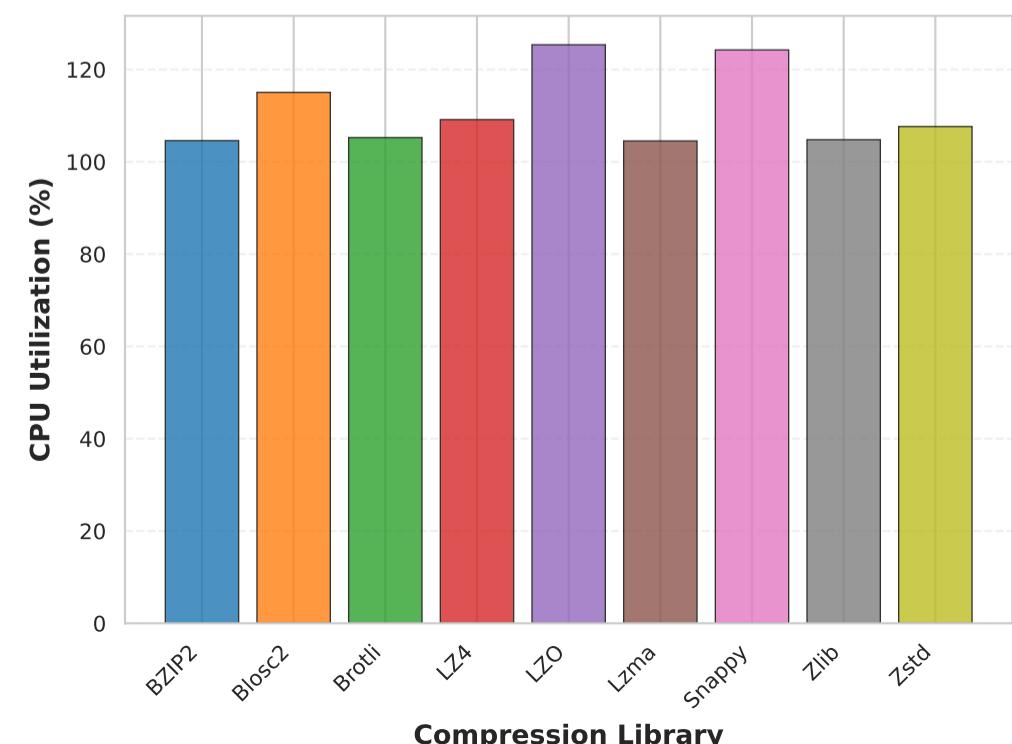
Compression Time

Decompression Time

Compression Ratio

Compression CPU Usage

Decompression CPU Usage
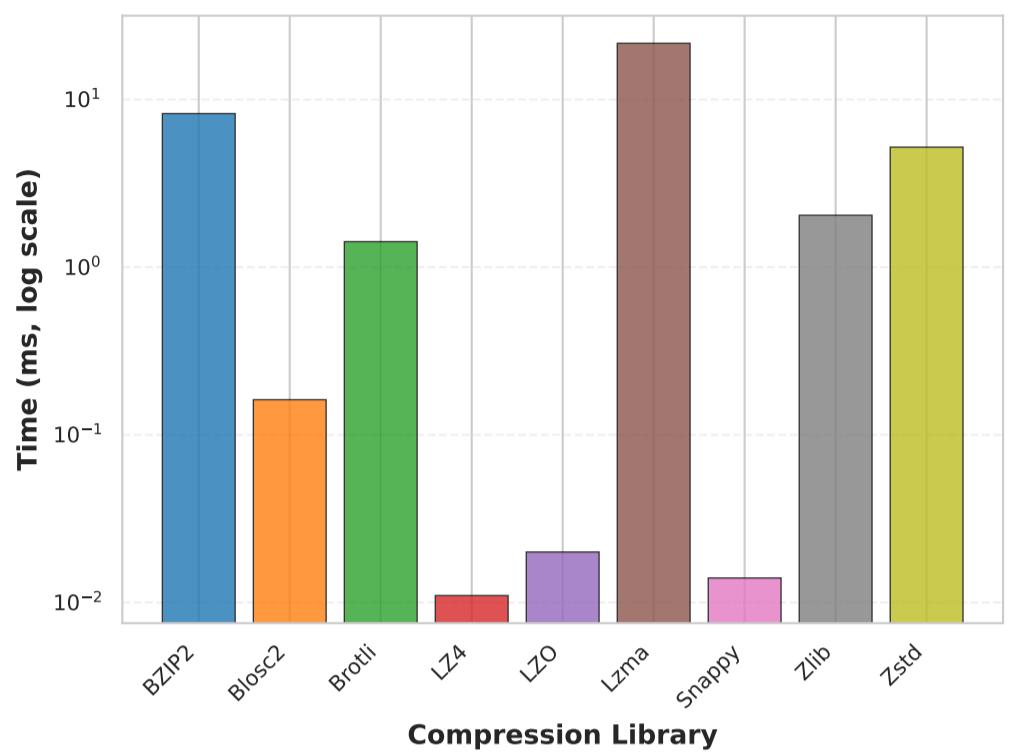
**Performance Summary (64KB chunks)**
Sorted by Compression Ratio
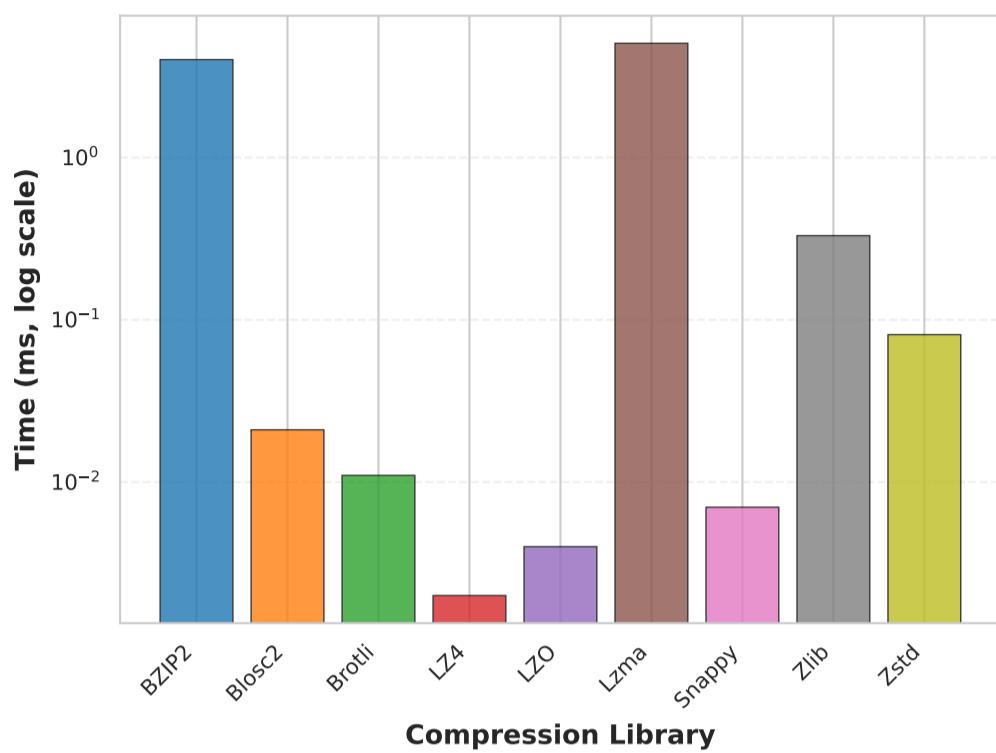
Library	Ratio	Time (ms)	CPU%
Zstd	1.81x	11.2	105%
Lzma	1.77x	20.9	104%
Brotli	1.71x	0.8	105%
BZIP2	1.70x	7.1	104%
Zlib	1.62x	2.9	105%
LZ4	1.03x	0.1	107%
Snappy	1.00x	0.0	128%
Blosc2	1.00x	0.1	108%
LZO	1.00x	0.0	138%

Parameter Study: normal_80
Standard deviation σ = 80 (controls clustering)
Char Data Type, 64KB Chunk Size
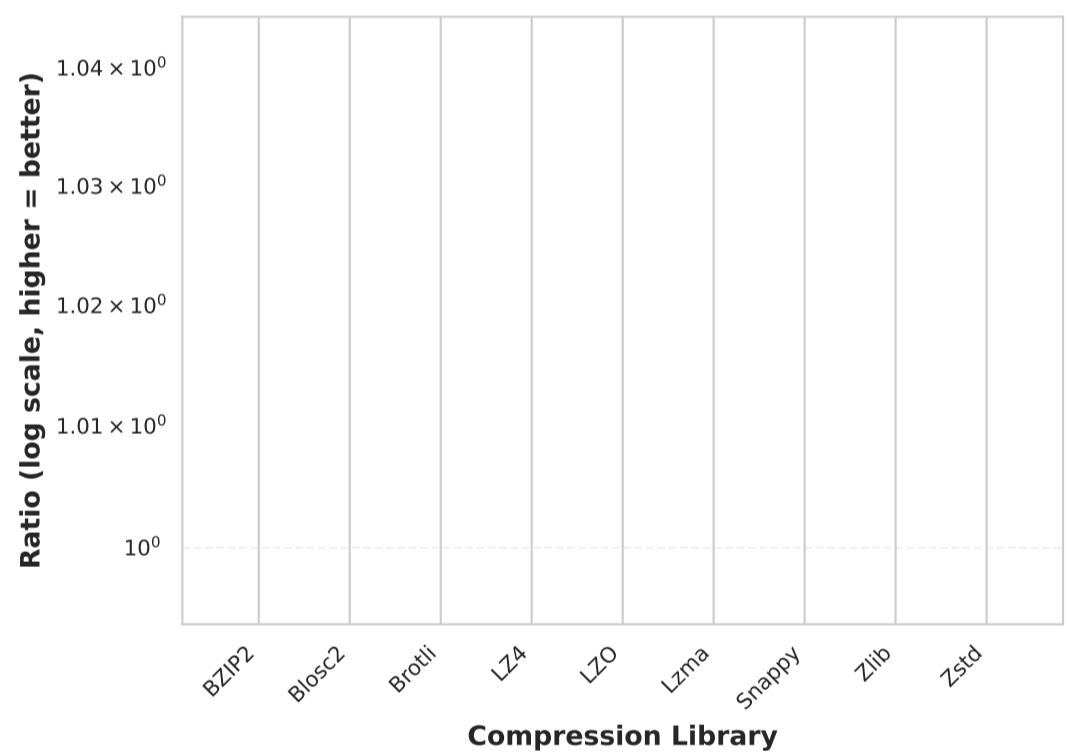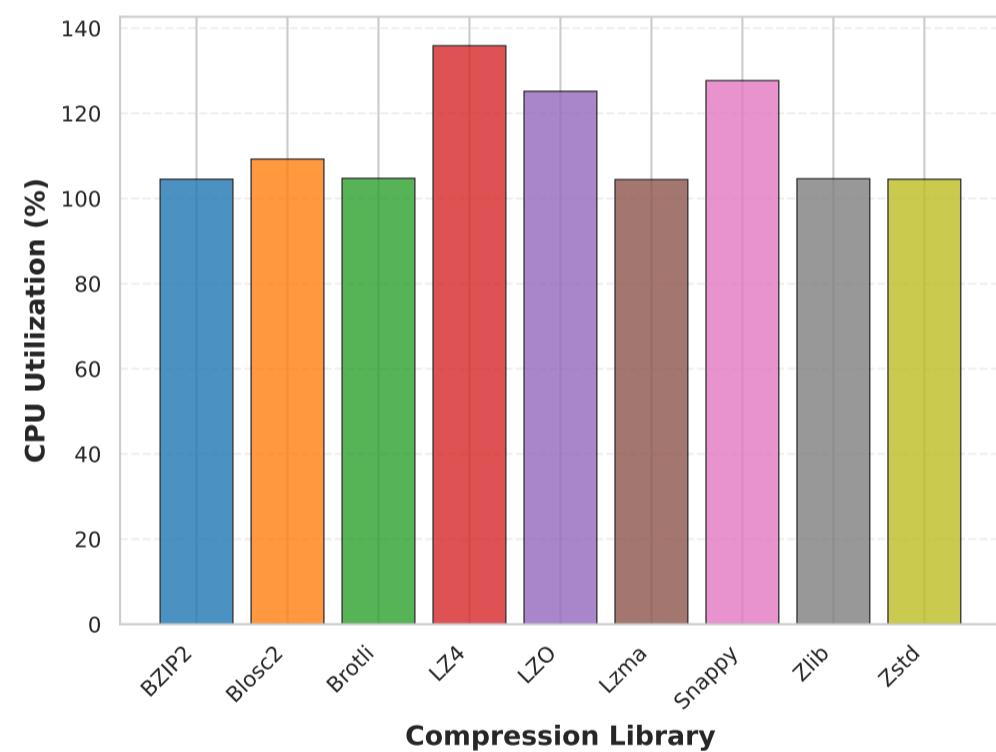
Compression Time

Decompression Time
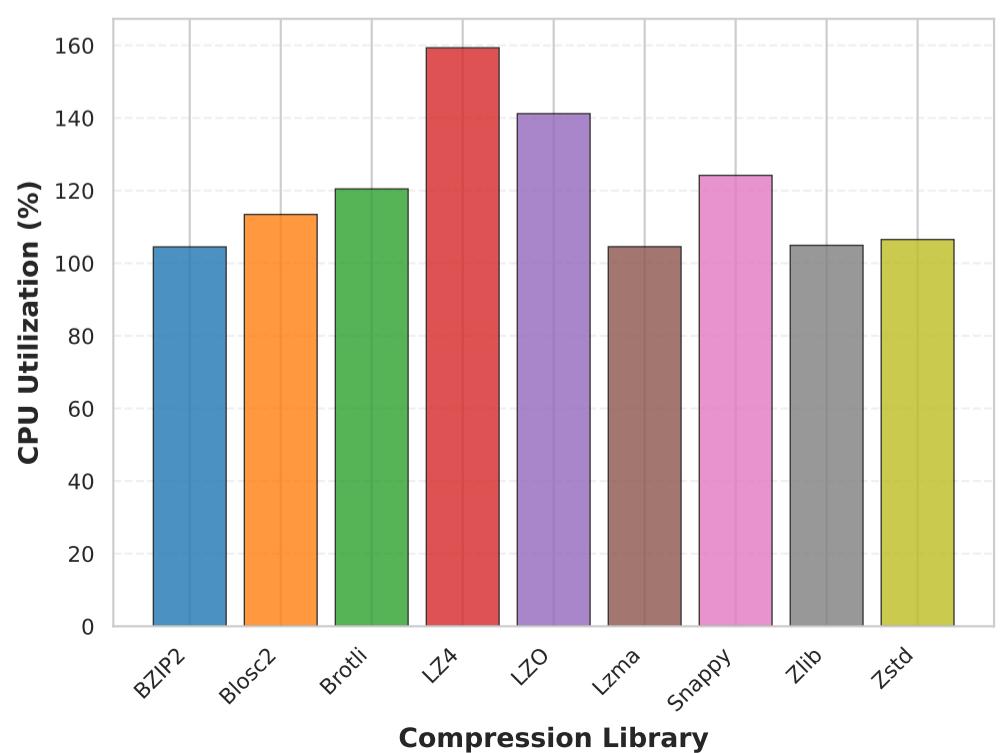
Compression Ratio

Compression CPU Usage
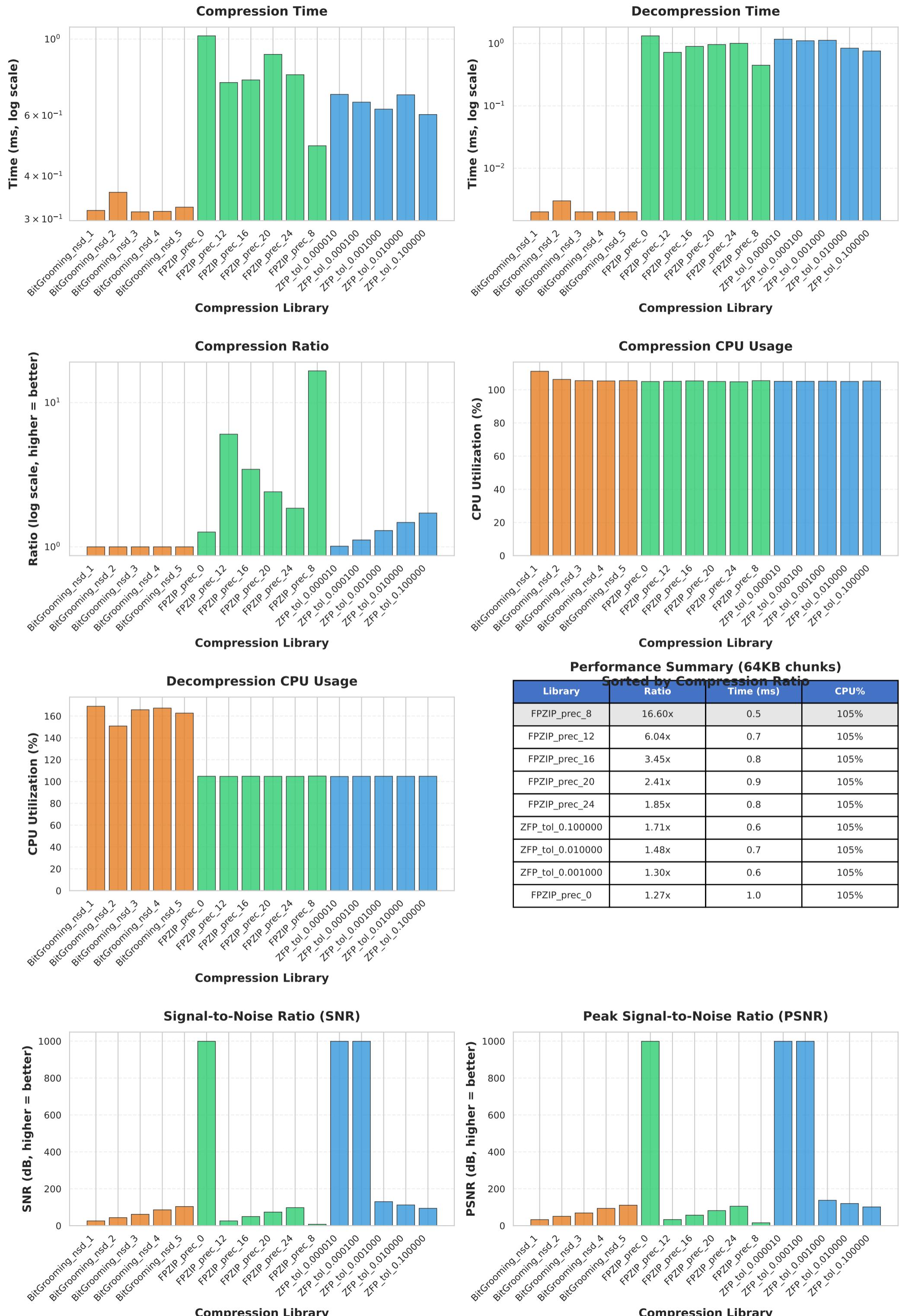
Decompression CPU Usage

Performance Summary (64KB chunks)
Sorted by Compression Ratio
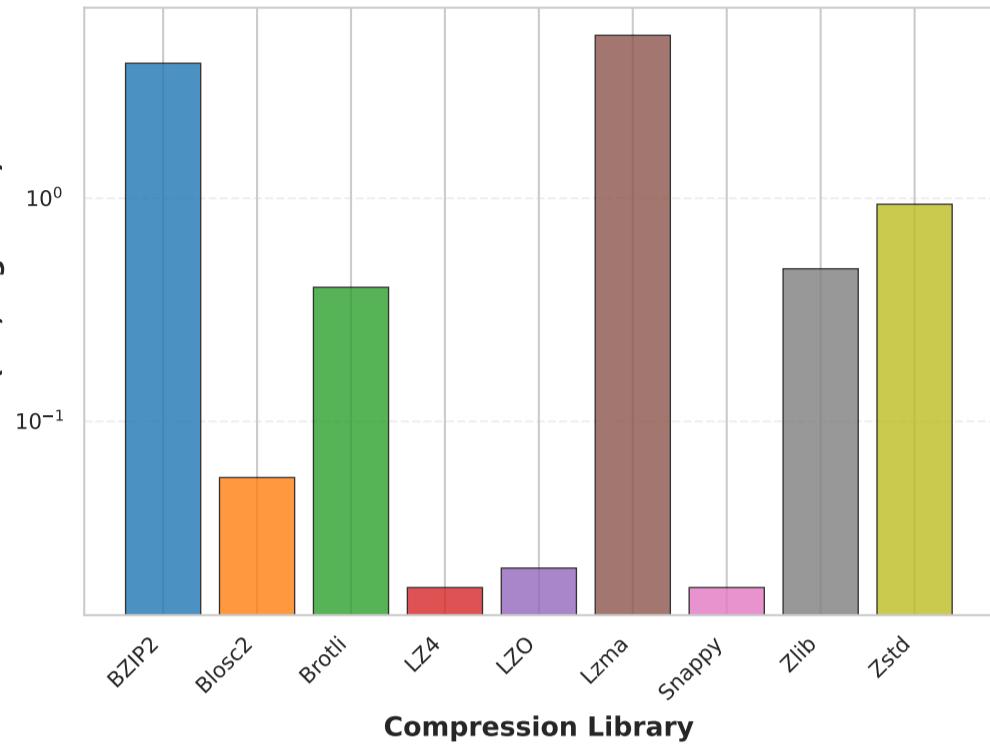
| Library	Ratio	Time (ms)	CPU%
Zstd	1.04x	5.2	105%
Zlib	1.04x	2.0	105%
Lzma	1.03x	21.6	104%
Snappy	1.00x	0.0	128%
Brotli	1.00x	1.4	105%
Blosc2	1.00x	0.2	109%
BZIP2	1.00x	8.2	105%
LZ4	1.00x	0.0	136%
LZO	1.00x	0.0	125%

Parameter Study: normal_float
Float data: Normal distribution (μ=500, σ=200)
Float Data Type, 64KB Chunk Size

Performance Summary (64KB chunks)
Sorted by Compression Ratio

| Library	Ratio	Time (ms)	CPU%
FPZIP_prec_8	16.60x	0.5	105%
FPZIP_prec_12	6.04x	0.7	105%
FPZIP_prec_16	3.45x	0.8	105%
FPZIP_prec_20	2.41x	0.9	105%
FPZIP_prec_24	1.85x	0.8	105%
ZFP_tol_0.100000	1.71x	0.6	105%
ZFP_tol_0.010000	1.48x	0.7	105%
ZFP_tol_0.001000	1.30x	0.6	105%
FPZIP_prec_0	1.27x	1.0	105%
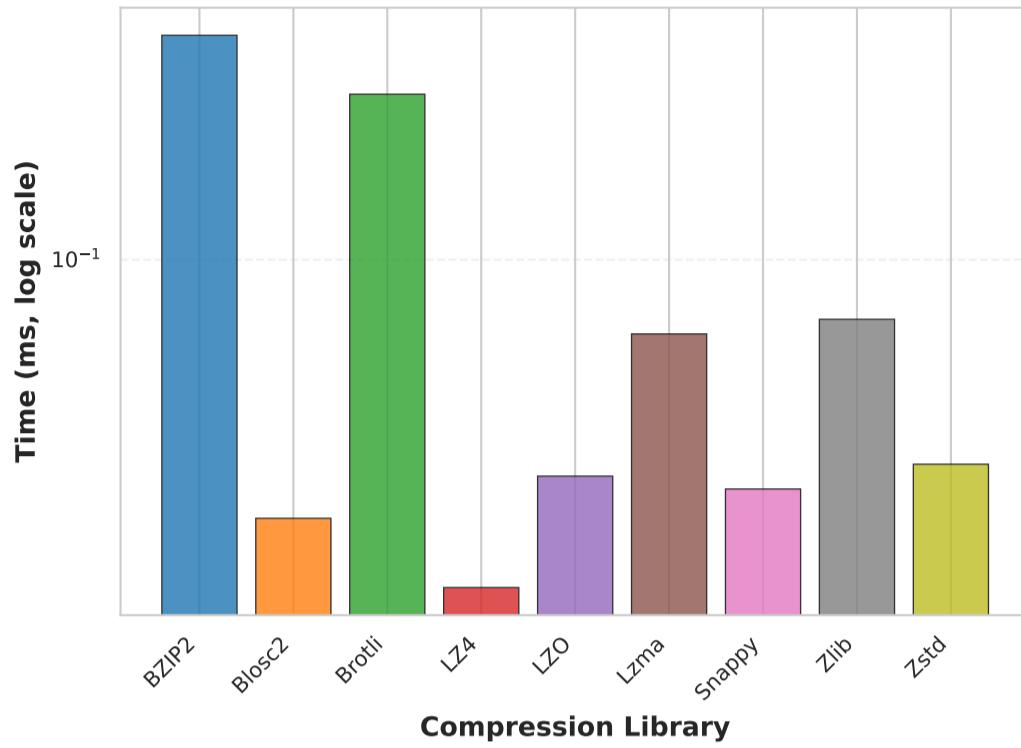
Parameter Study: repeating
Deterministic pattern (AAABBBCCC...): Extremely compressible
### Char Data Type, 64KB Chunk Size
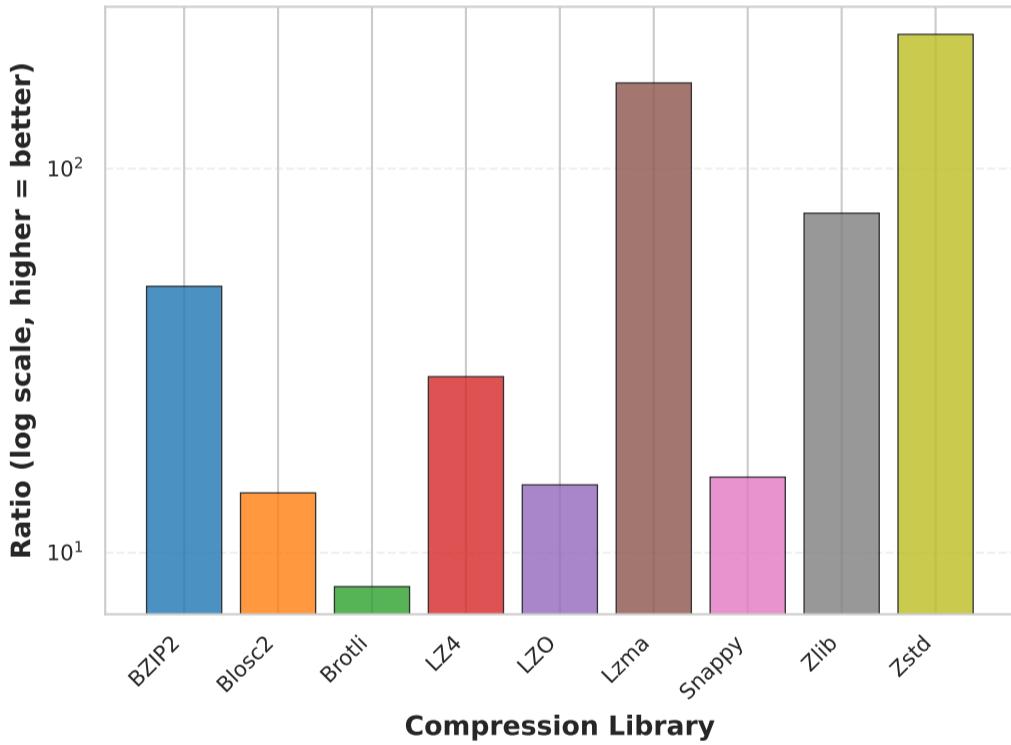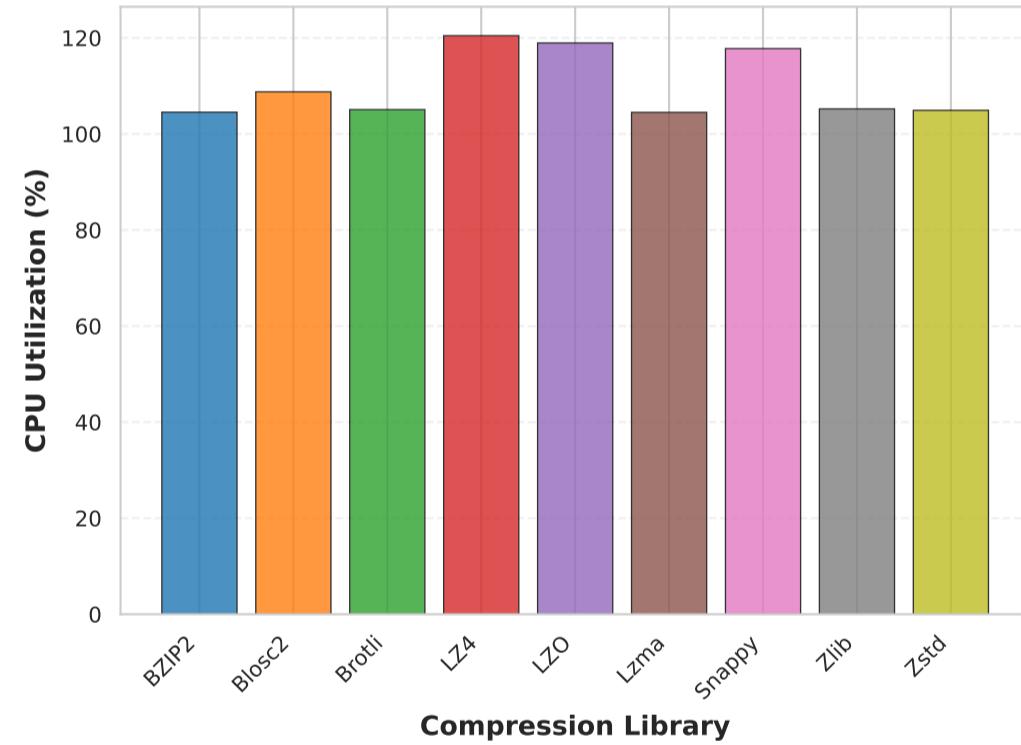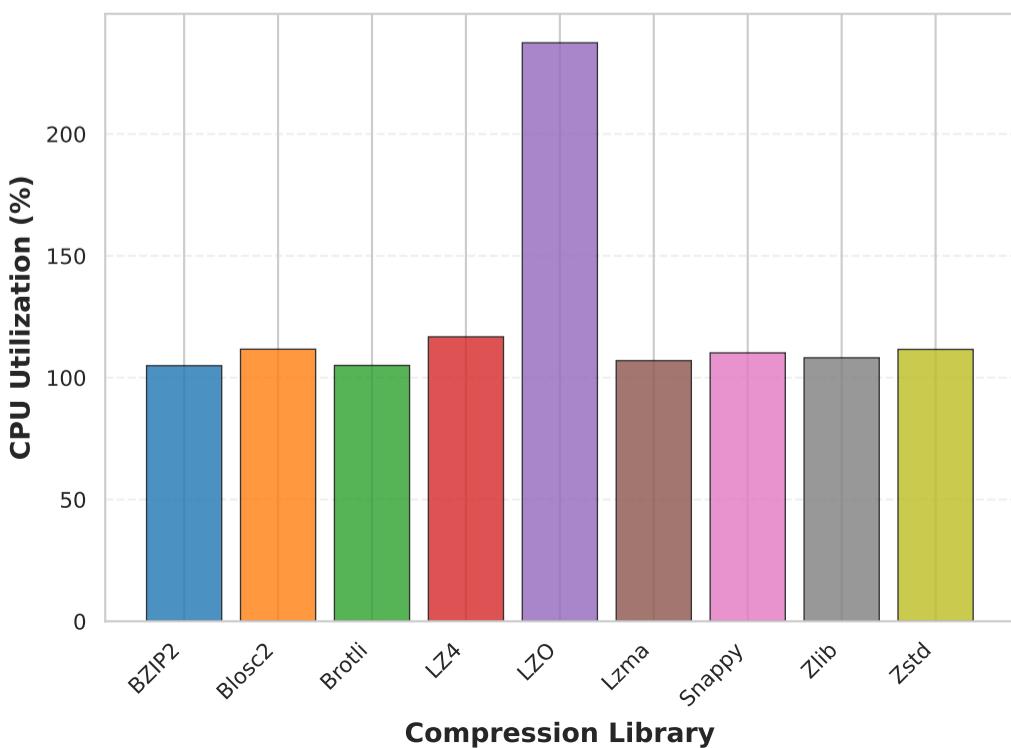
**Compression Time**

Decompression Time

Compression Ratio

Compression CPU Usage

Decompression CPU Usage
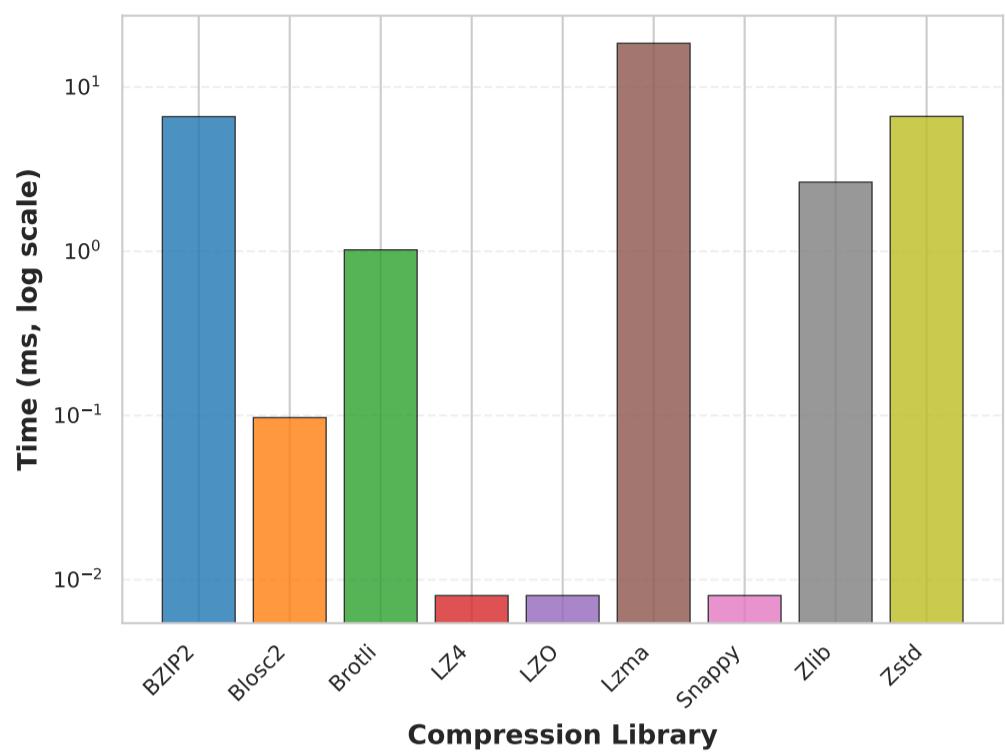
Performance Summary (64KB chunks)
Sorted by Compression Ratio
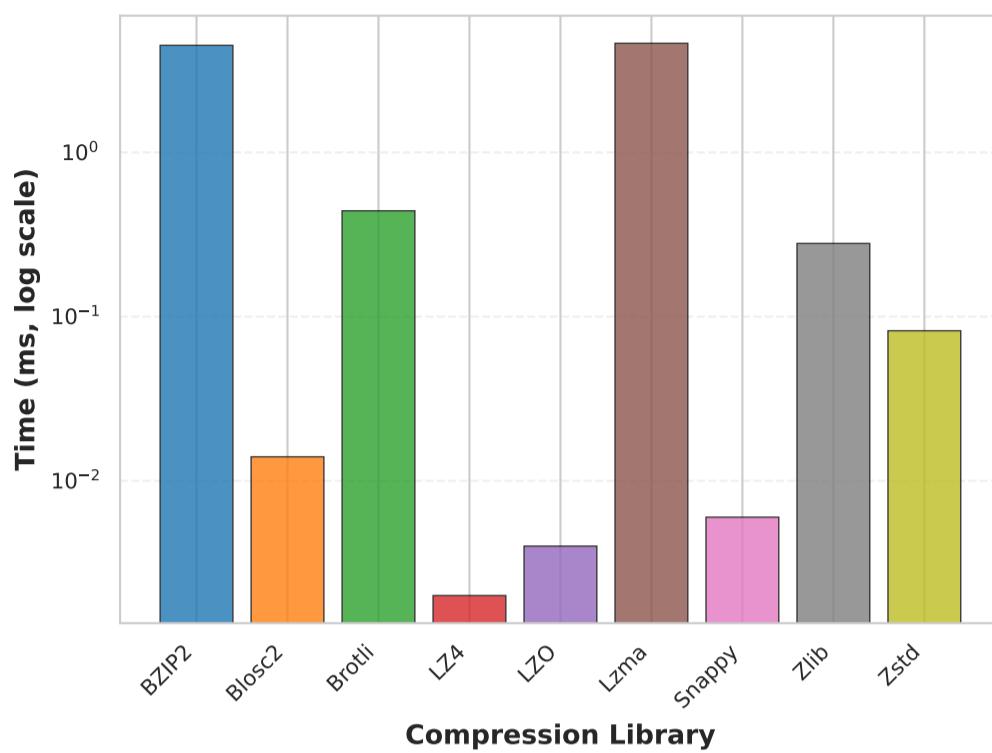
Library	Ratio	Time (ms)	CPU%
Zstd	223.67x	0.9	105%
Lzma	167.18x	5.4	104%
Zlib	76.56x	0.5	105%
BZIP2	49.39x	4.0	105%
LZ4	28.73x	0.0	120%
Snappy	15.73x	0.0	118%
LZO	15.02x	0.0	119%
Blosc2	14.31x	0.1	109%
Brotli	8.16x	0.4	105%

Parameter Study: uniform_127
Max value = 127 (controls entropy/bit usage)
Char Data Type, 64KB Chunk Size
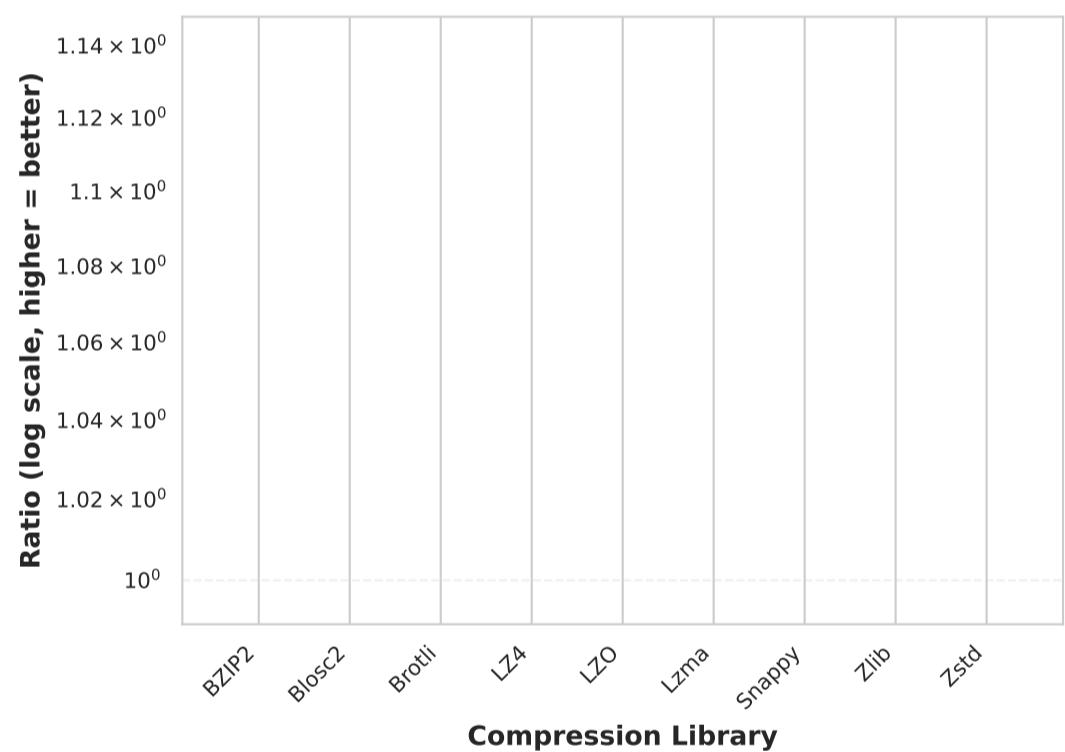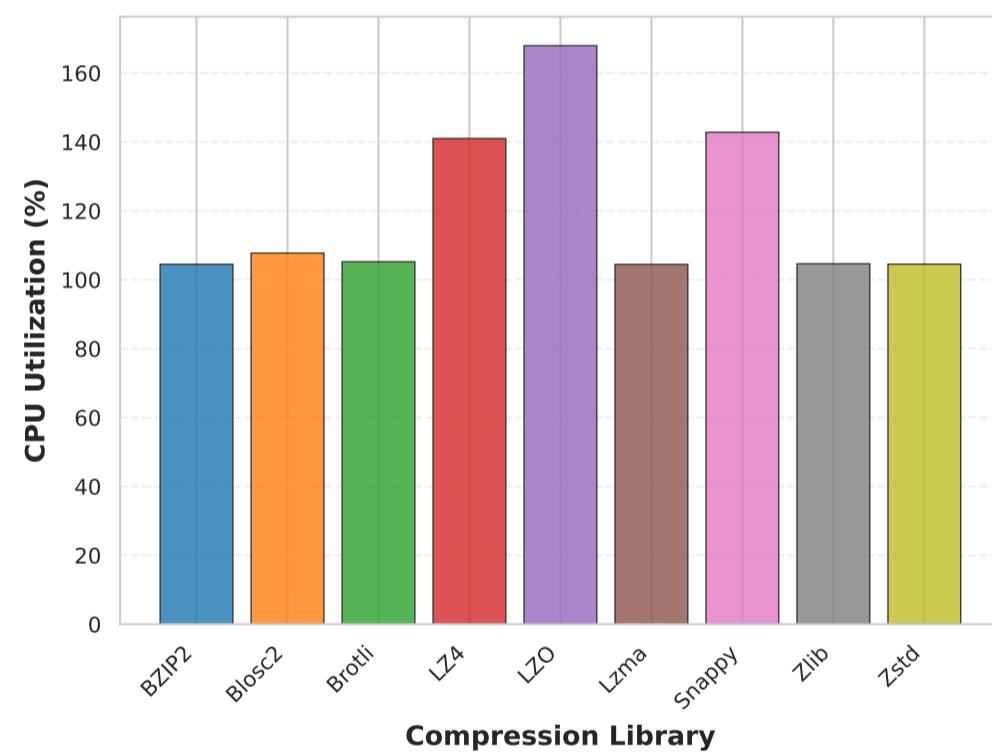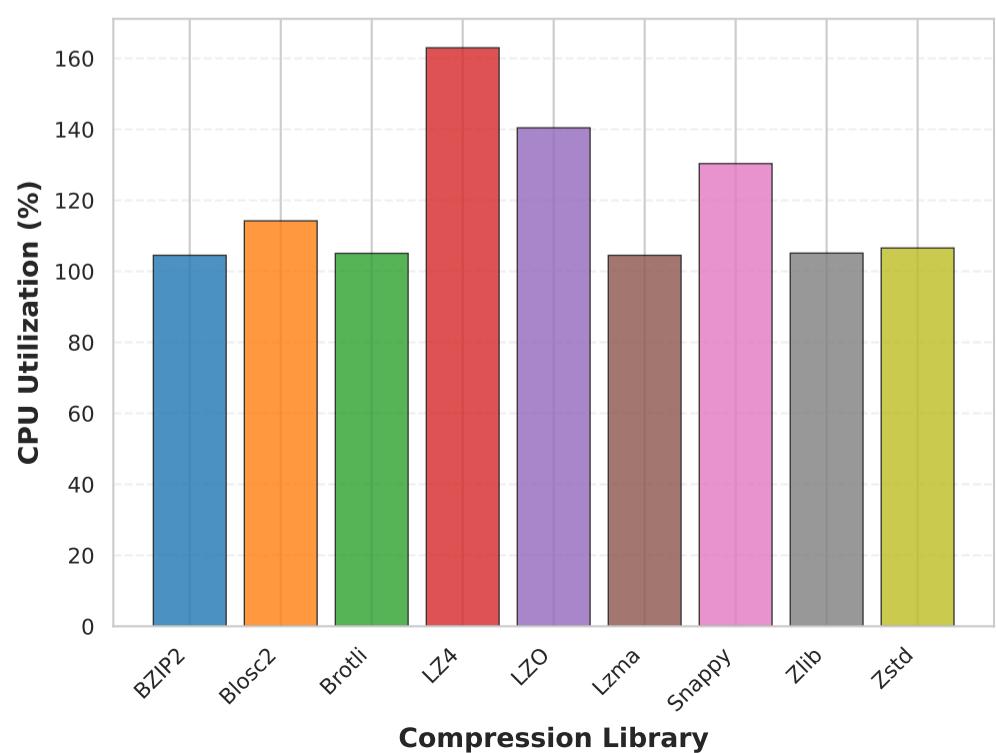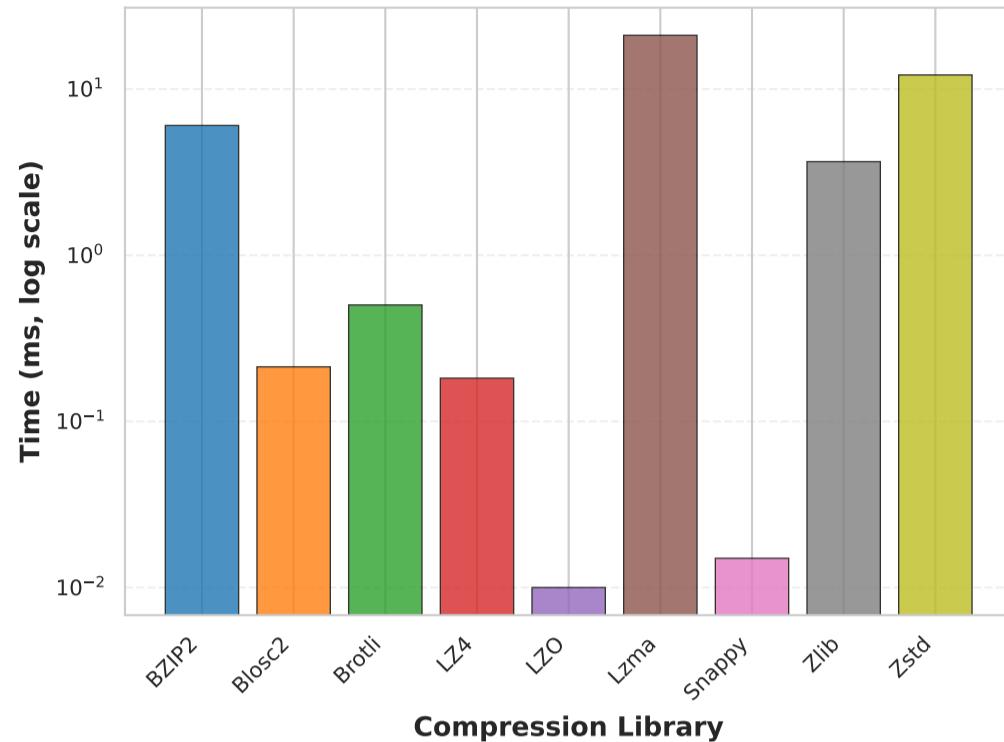
Performance Summary (64KB chunks)
Sorted by Compression Ratio
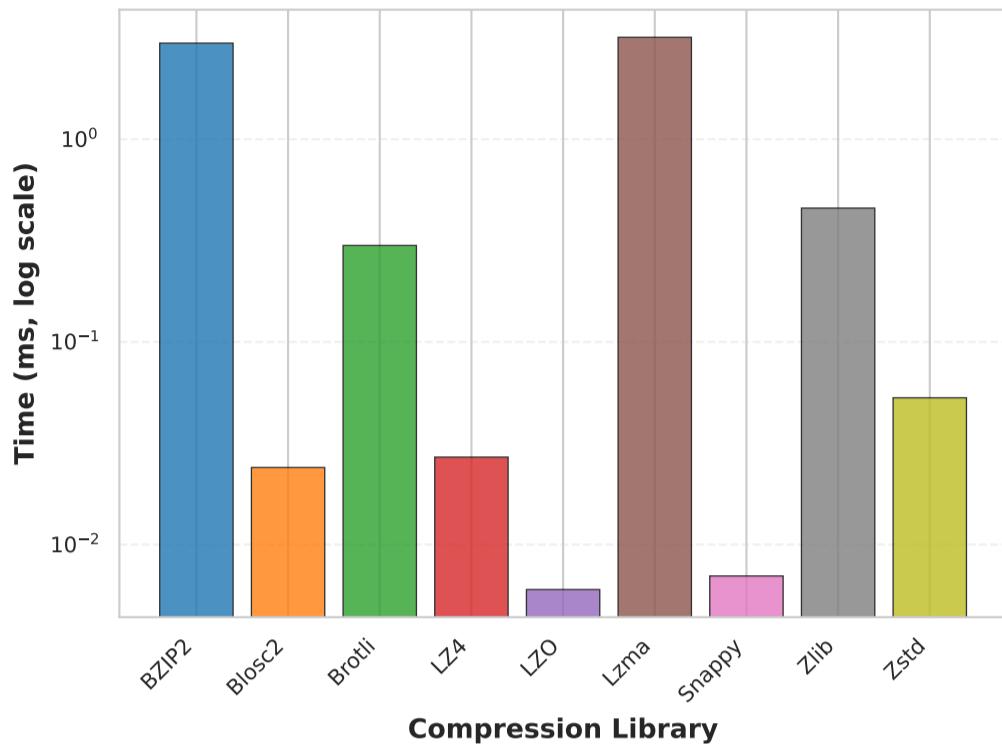
Library	Ratio	Time (ms)	CPU%
Zstd	1.14x	6.6	105%
Zlib	1.14x	2.6	105%
BZIP2	1.13x	6.6	104%
Lzma	1.12x	18.5	104%
Brotli	1.07x	1.0	105%
Snappy	1.00x	0.0	143%
Blosc2	1.00x	0.1	108%
LZ4	1.00x	0.0	141%
LZO	1.00x	0.0	168%

Parameter Study: uniform_15
Max value = 15 (controls entropy/bit usage)
Char Data Type, 64KB Chunk Size
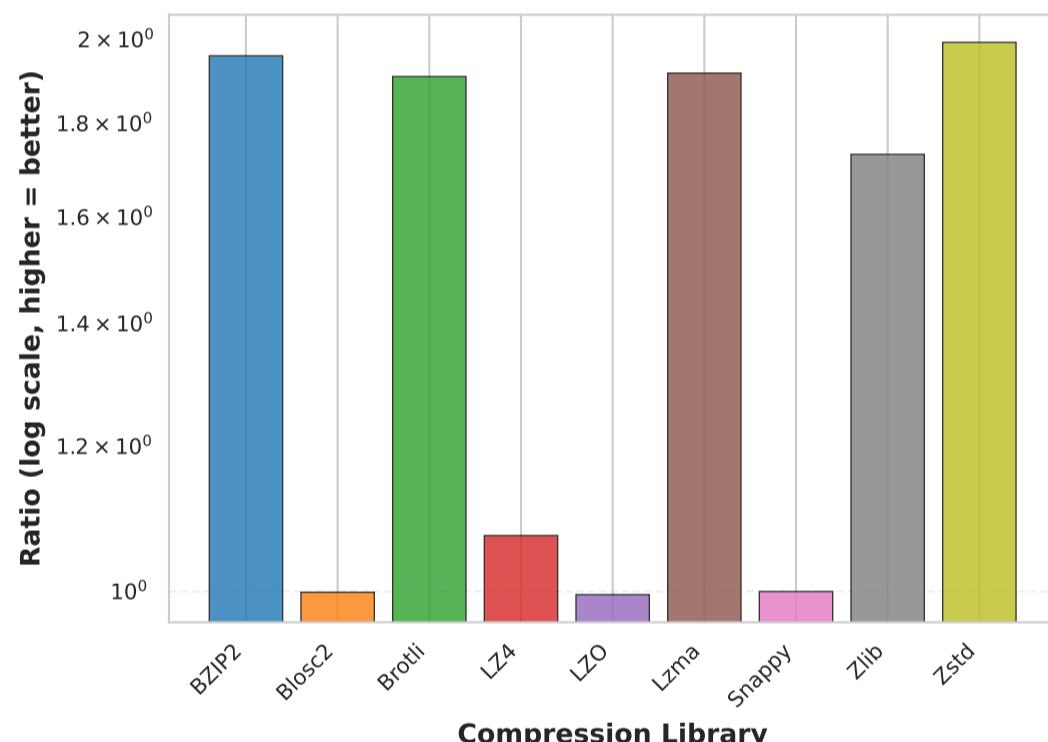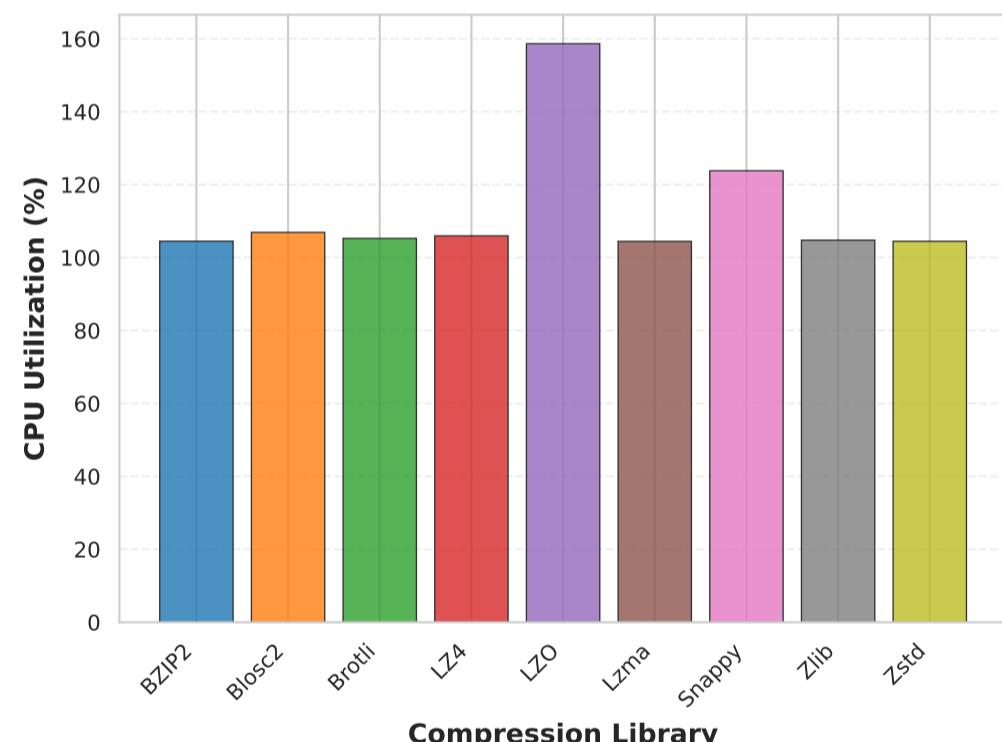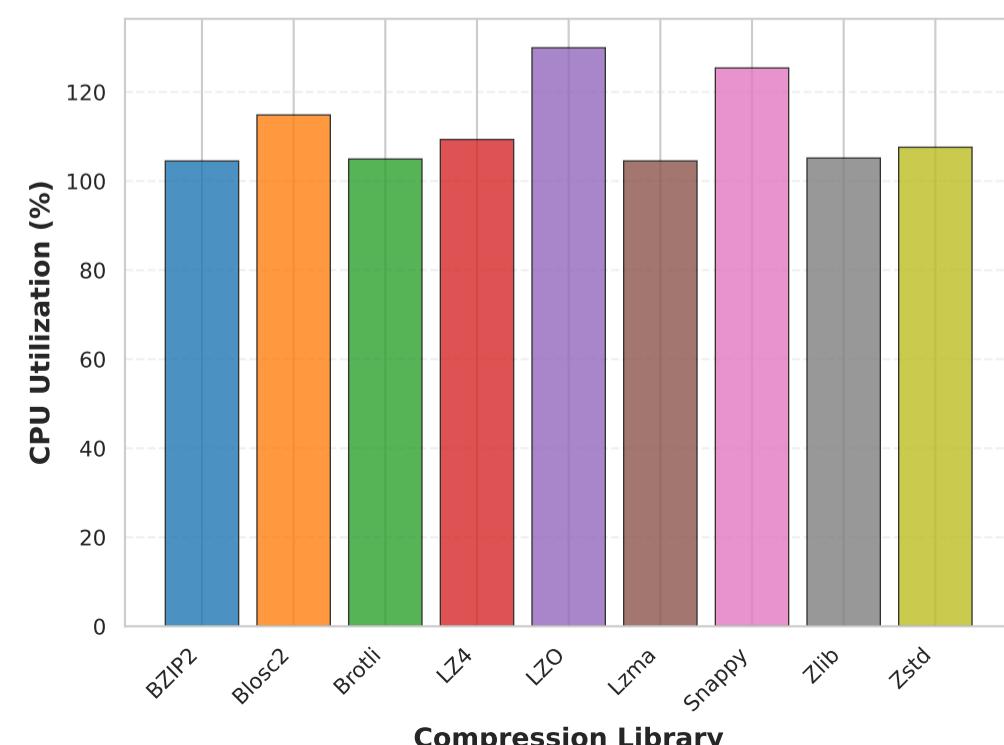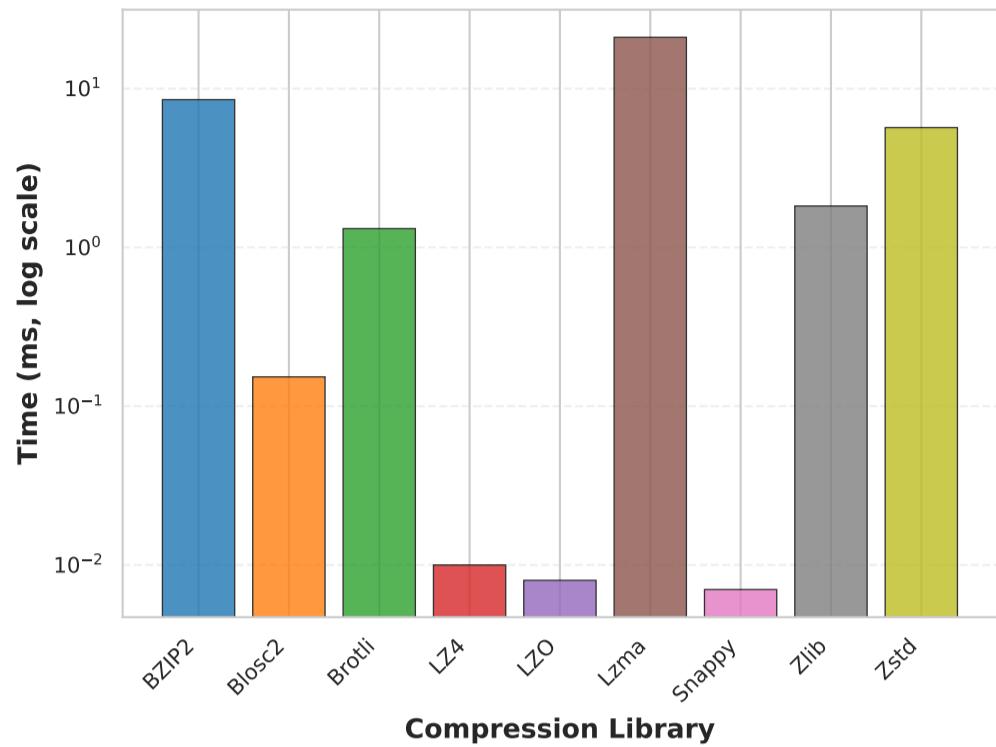
**Performance Summary (64KB chunks)
Sorted by Compression Ratio**
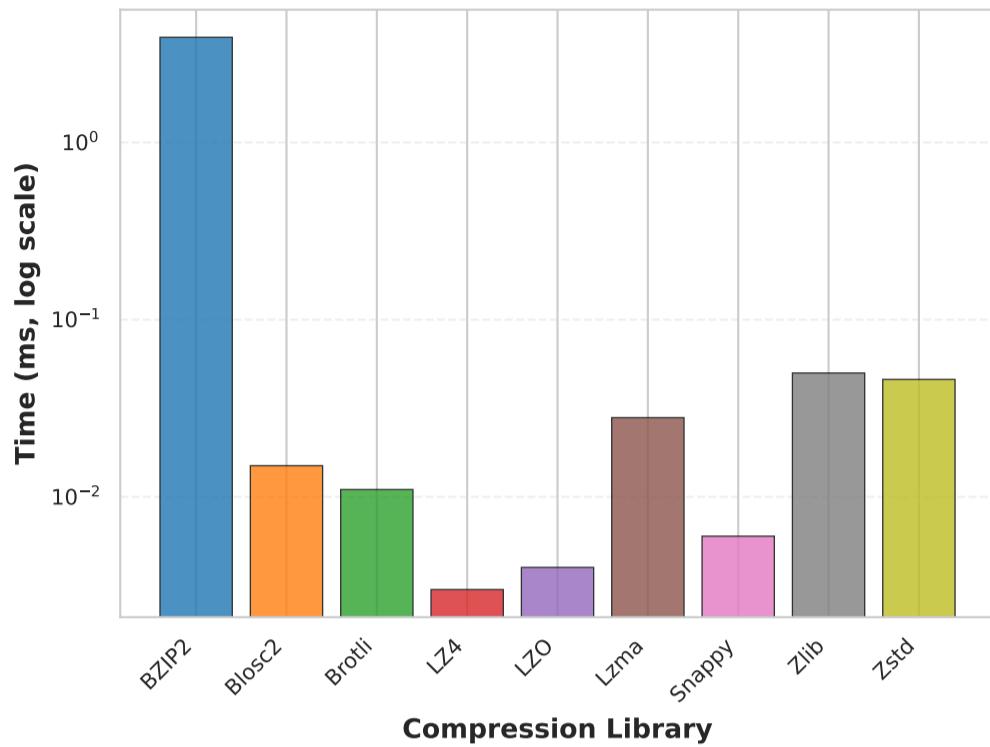
Library	Ratio	Time (ms)	CPU%
Zstd	1.99x	12.2	104%
BZIP2	1.96x	6.0	104%
Lzma	1.92x	21.1	104%
Brotli	1.91x	0.5	105%
Zlib	1.73x	3.7	105%
LZ4	1.07x	0.2	106%
Snappy	1.00x	0.0	124%
Blosc2	1.00x	0.2	107%
LZO	1.00x	0.0	159%

Parameter Study: uniform_255
Max value = 255 (controls entropy/bit usage)
Char Data Type, 64KB Chunk Size
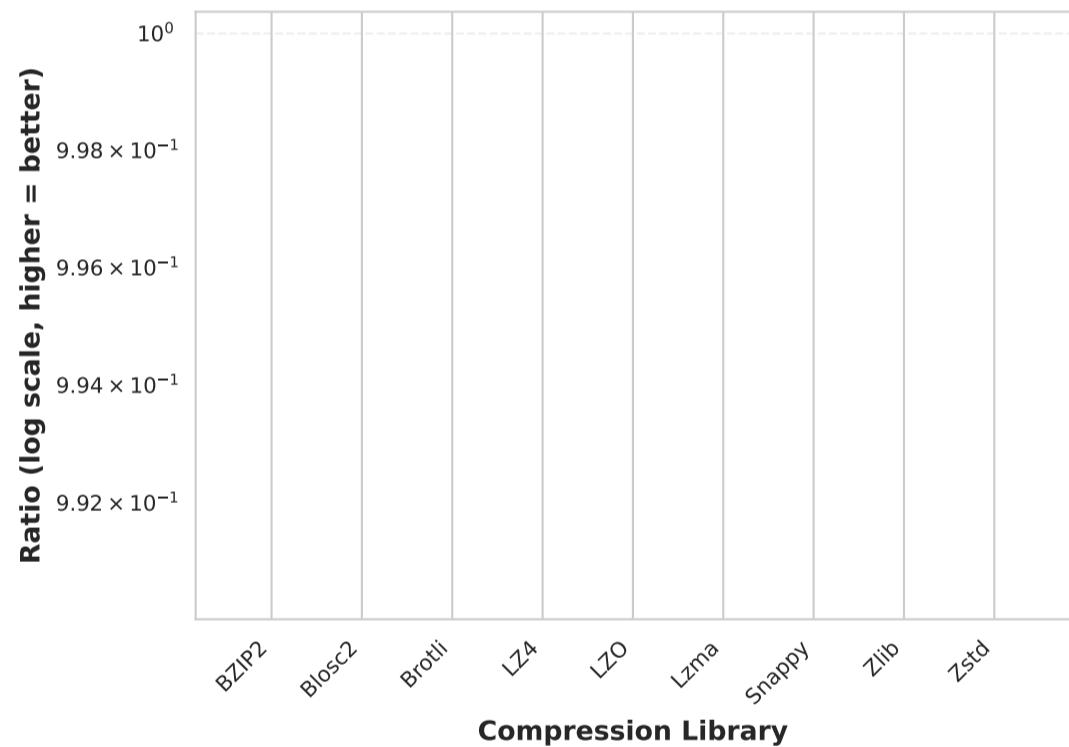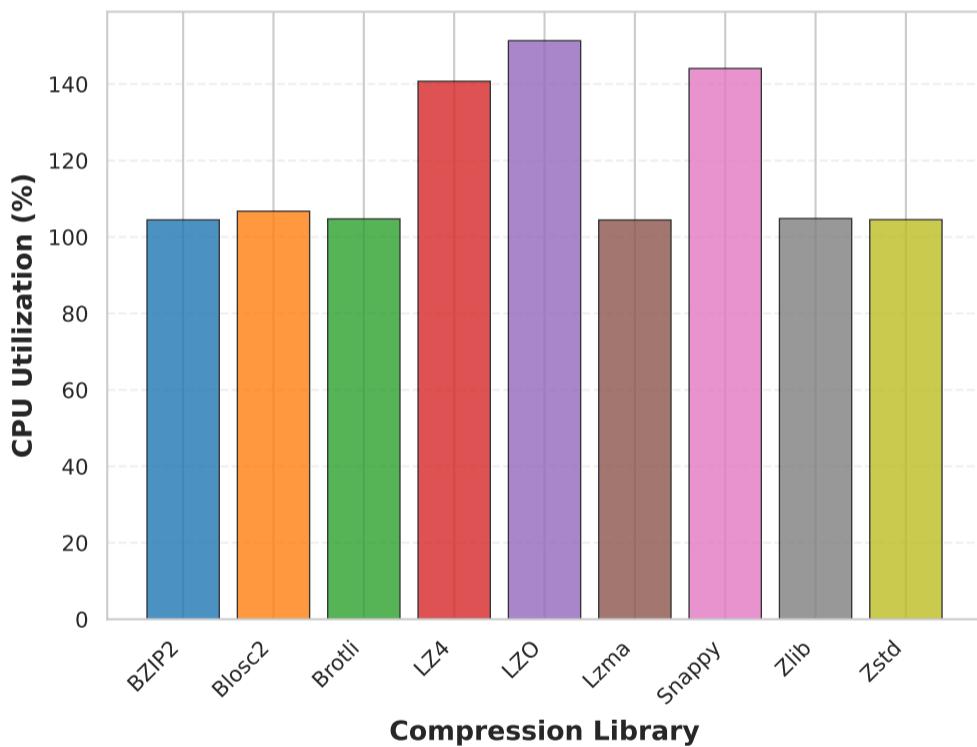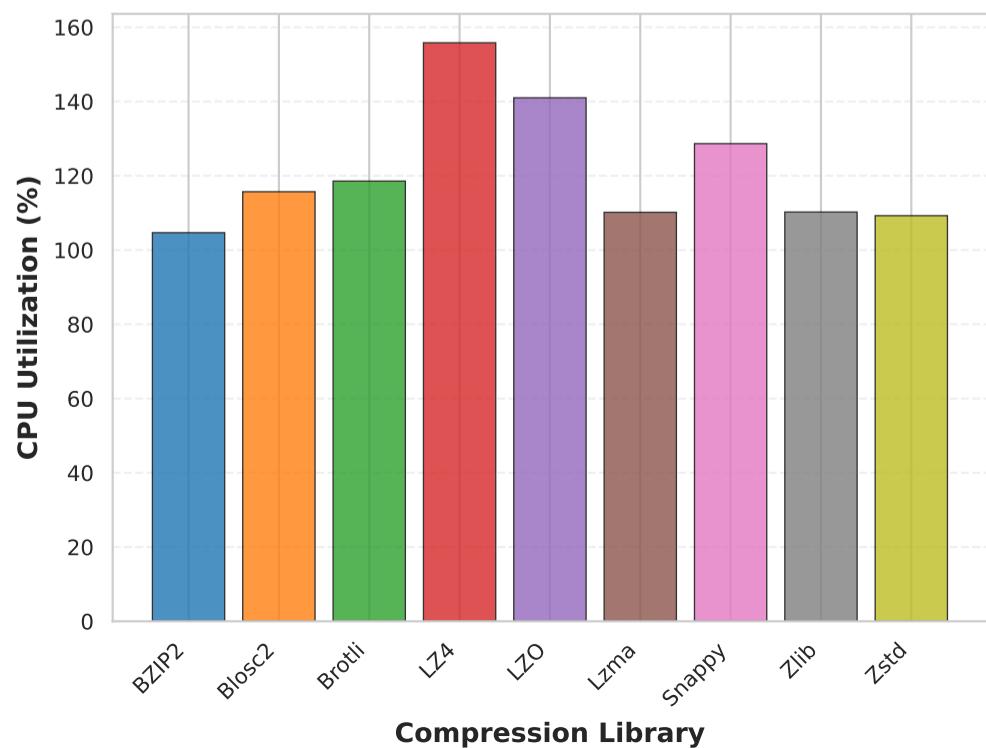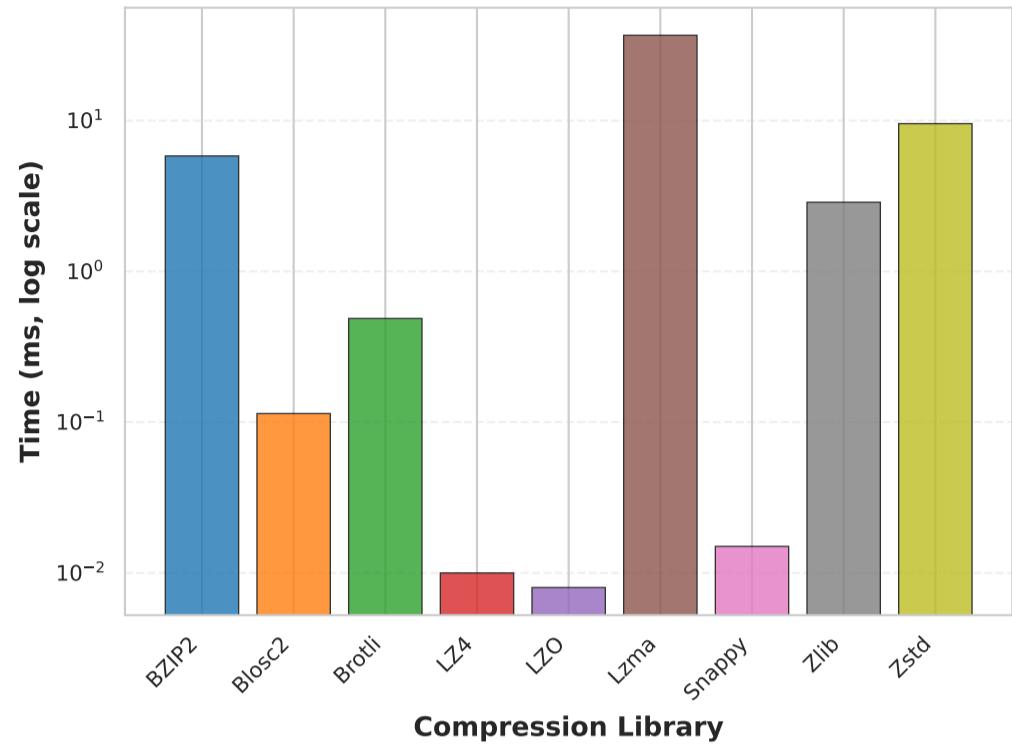
Performance Summary (64KB chunks)
**Sorted by Compression Ratio**
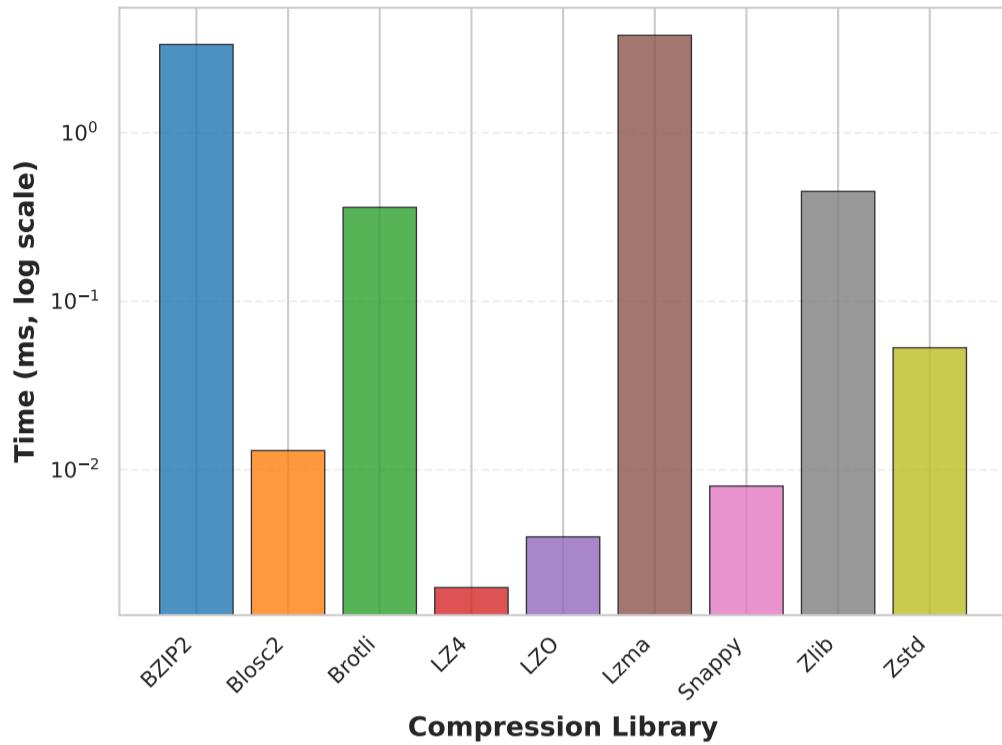
Library	Ratio	Time (ms)	CPU%
Snappy	1.00x	0.0	144%
Brotli	1.00x	1.3	105%
Zstd	1.00x	5.7	105%
Zlib	1.00x	1.8	105%
Lzma	1.00x	21.1	104%
Blosc2	1.00x	0.2	107%
LZ4	1.00x	0.0	141%
LZO	1.00x	0.0	151%
BZIP2	0.99x	8.5	104%

Parameter Study: uniform_31
Max value = 31 (controls entropy/bit usage)
Char Data Type, 64KB Chunk Size
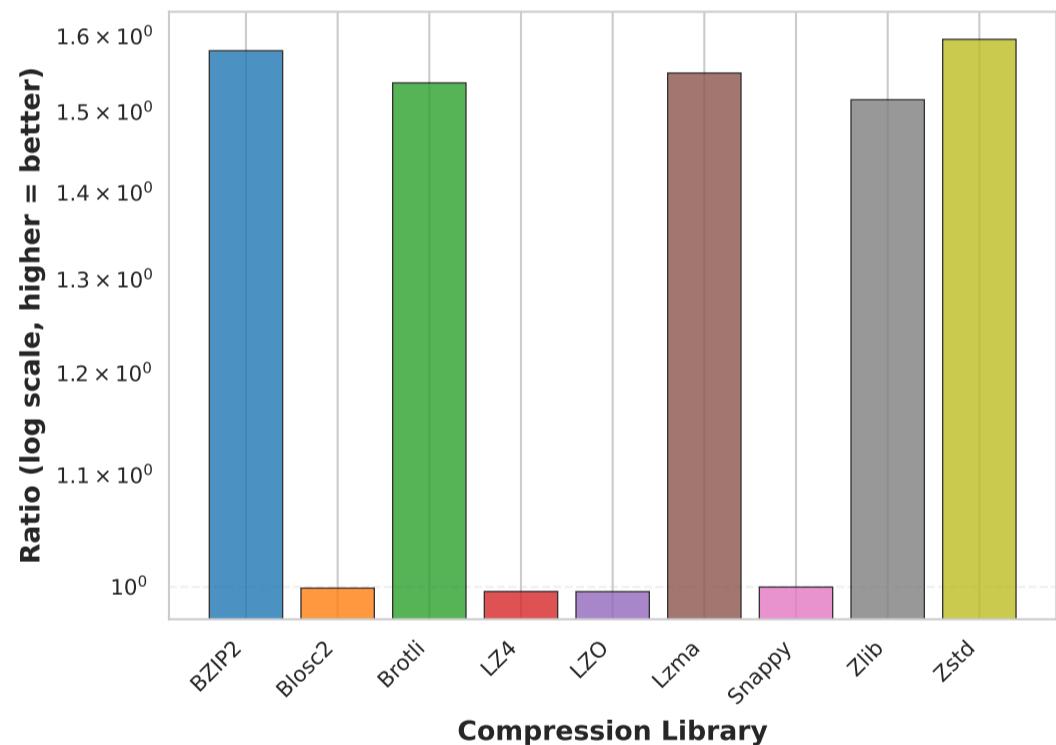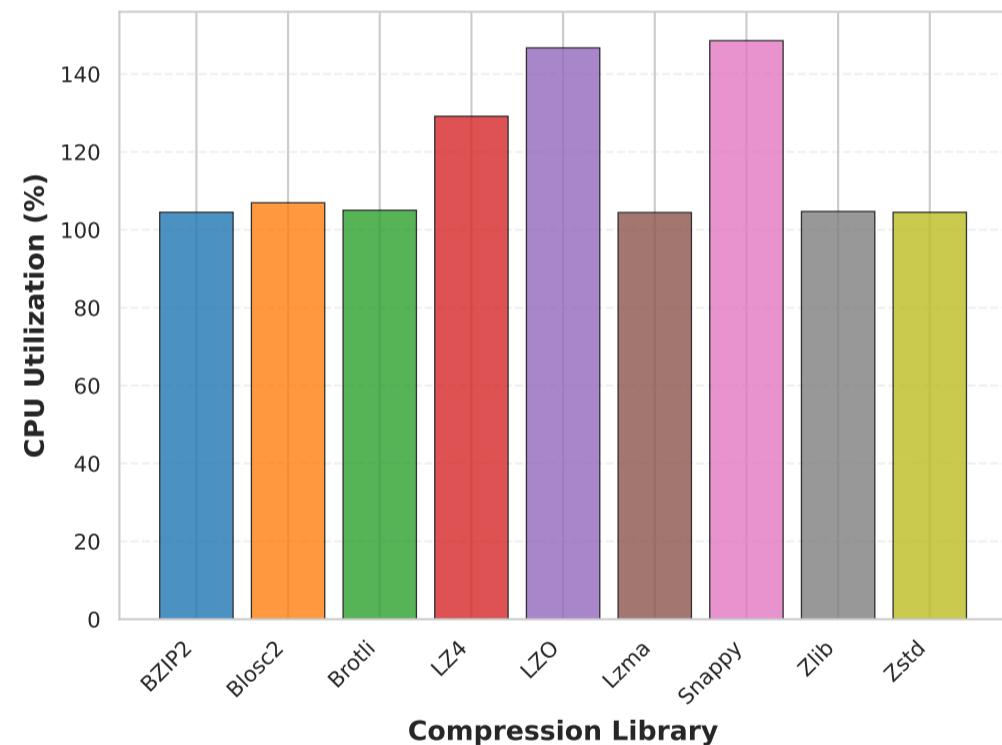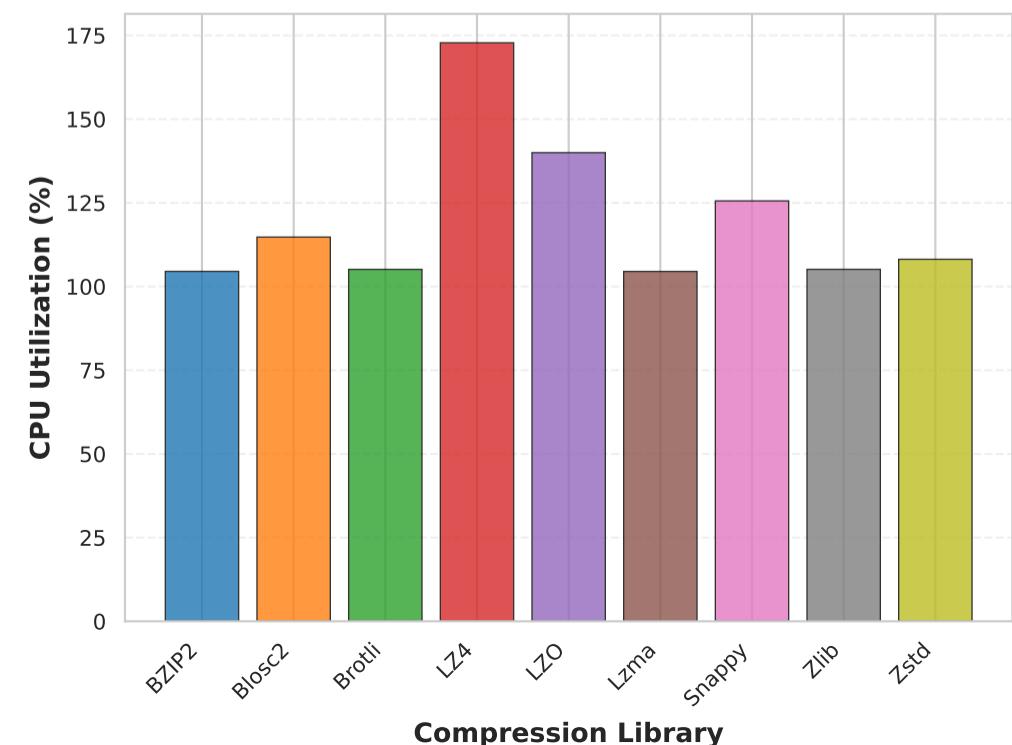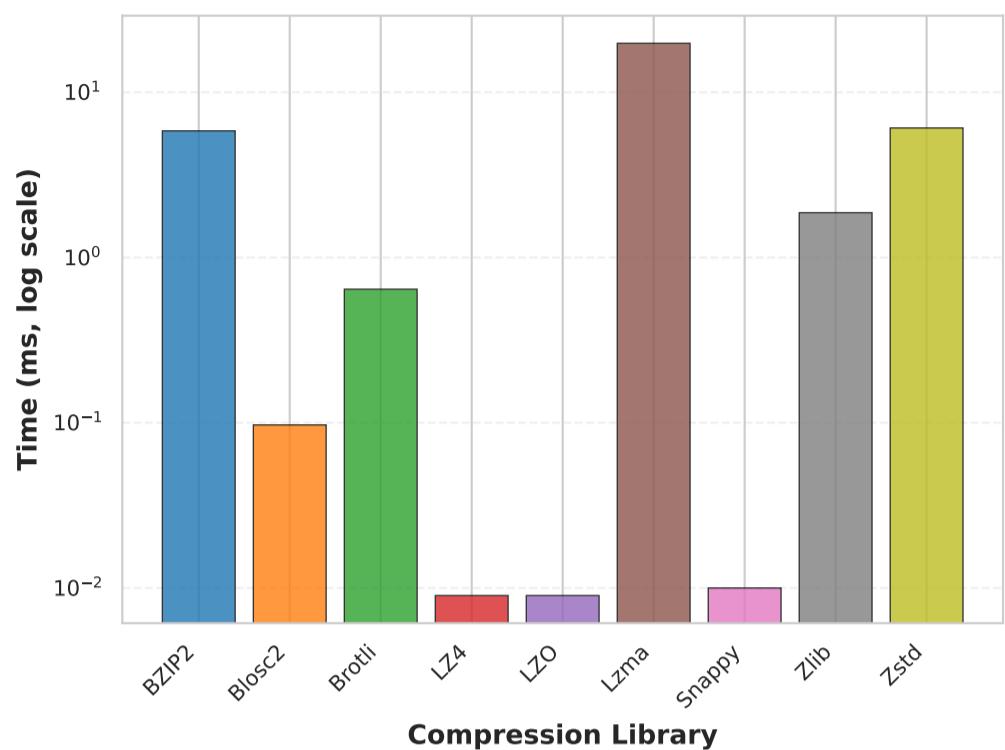
Performance Summary (64KB chunks)
### Sorted by Compression Ratio
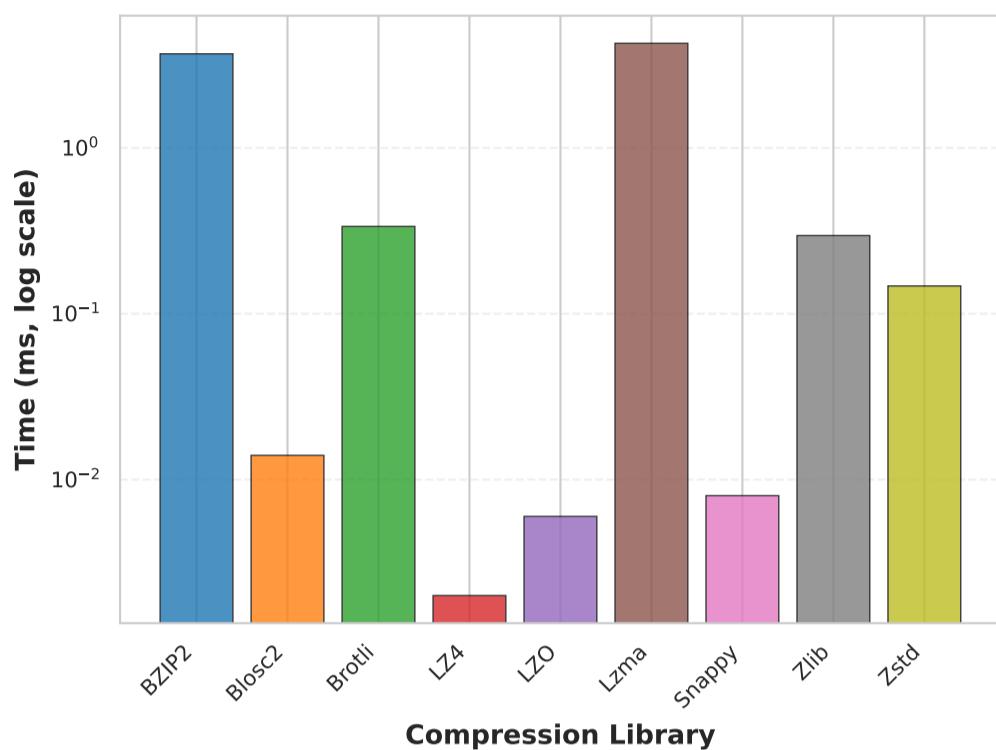
Library	Ratio	Time (ms)	CPU%
Zstd	1.60x	9.5	104%
BZIP2	1.58x	5.8	104%
Lzma	1.55x	36.8	104%
Brotli	1.54x	0.5	105%
Zlib	1.52x	2.9	105%
Snappy	1.00x	0.0	149%
Blosc2	1.00x	0.1	107%
LZ4	1.00x	0.0	129%
LZO	1.00x	0.0	147%

Parameter Study: uniform_63
Max value = 63 (controls entropy/bit usage)
Char Data Type, 64KB Chunk Size
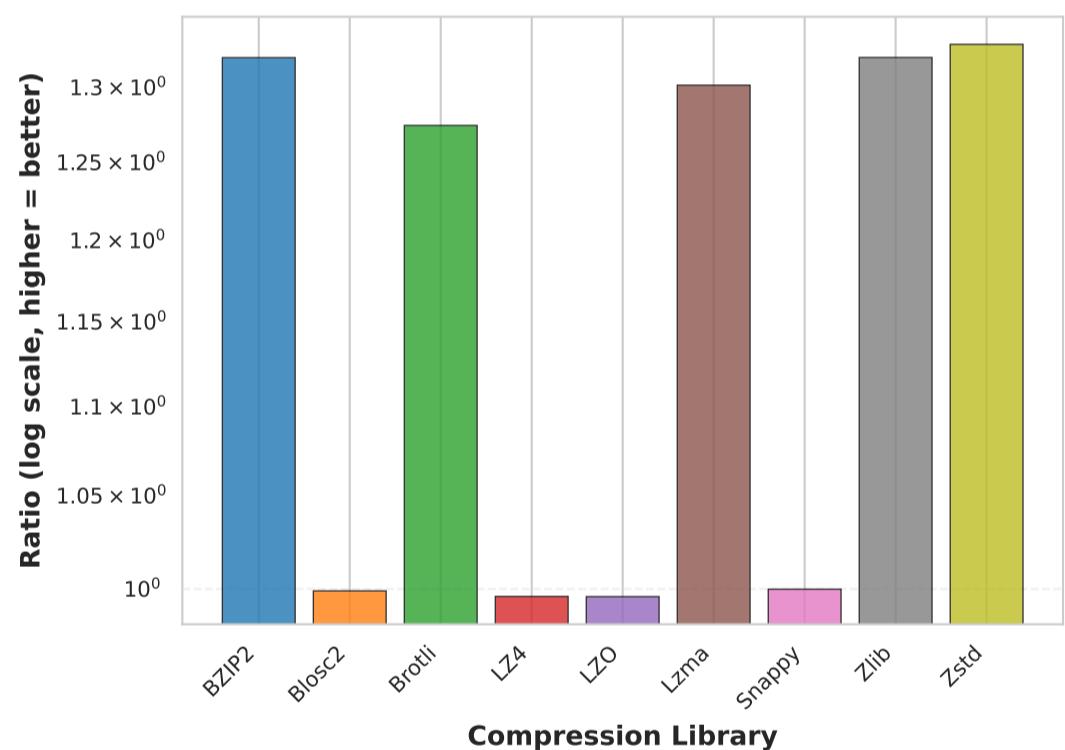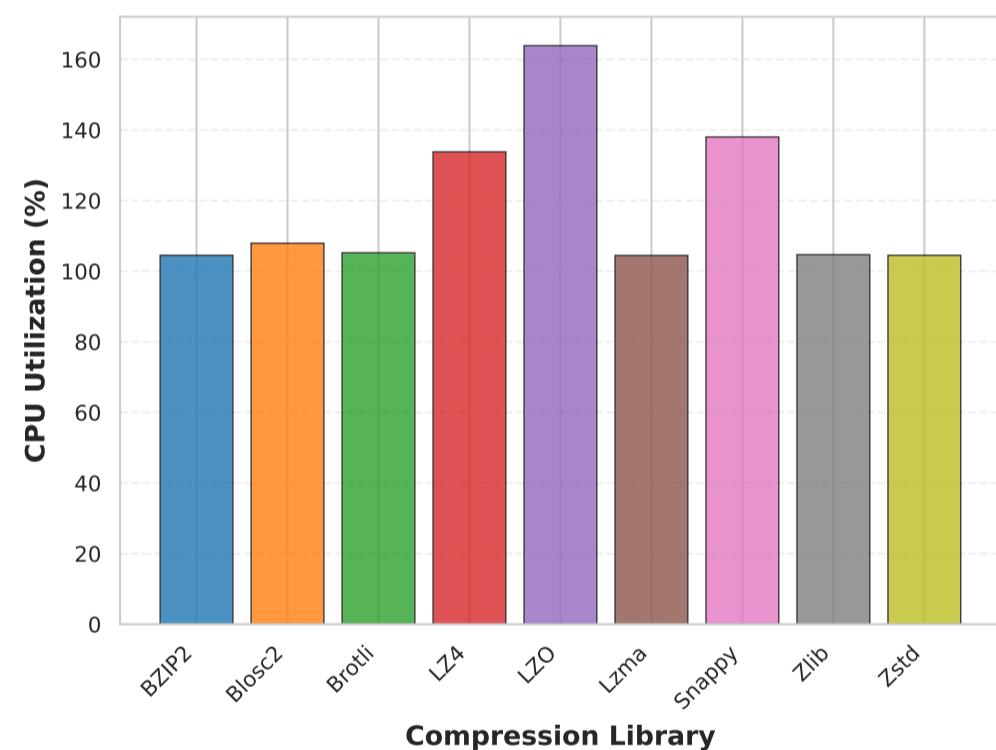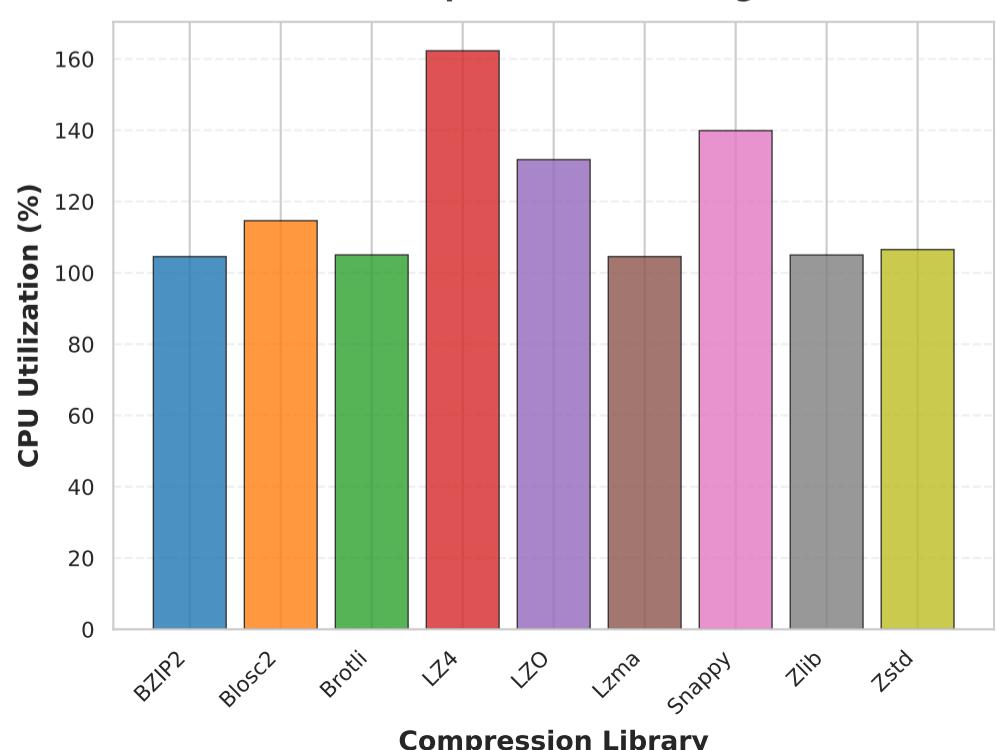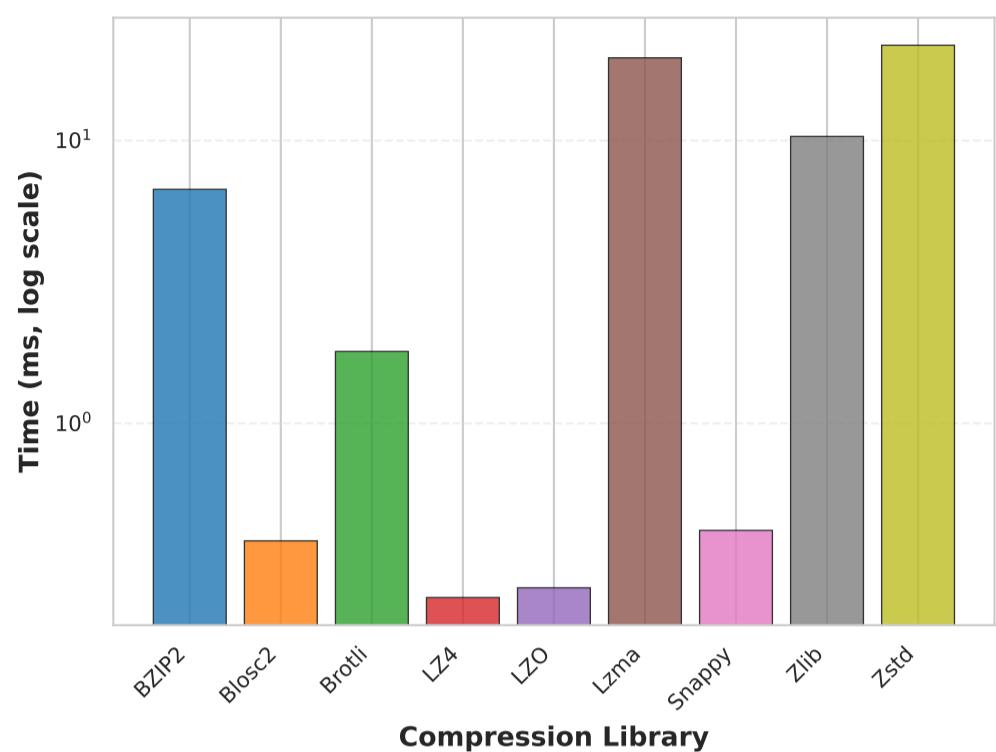
Performance Summary (64KB chunks)
Sorted by Compression Ratio
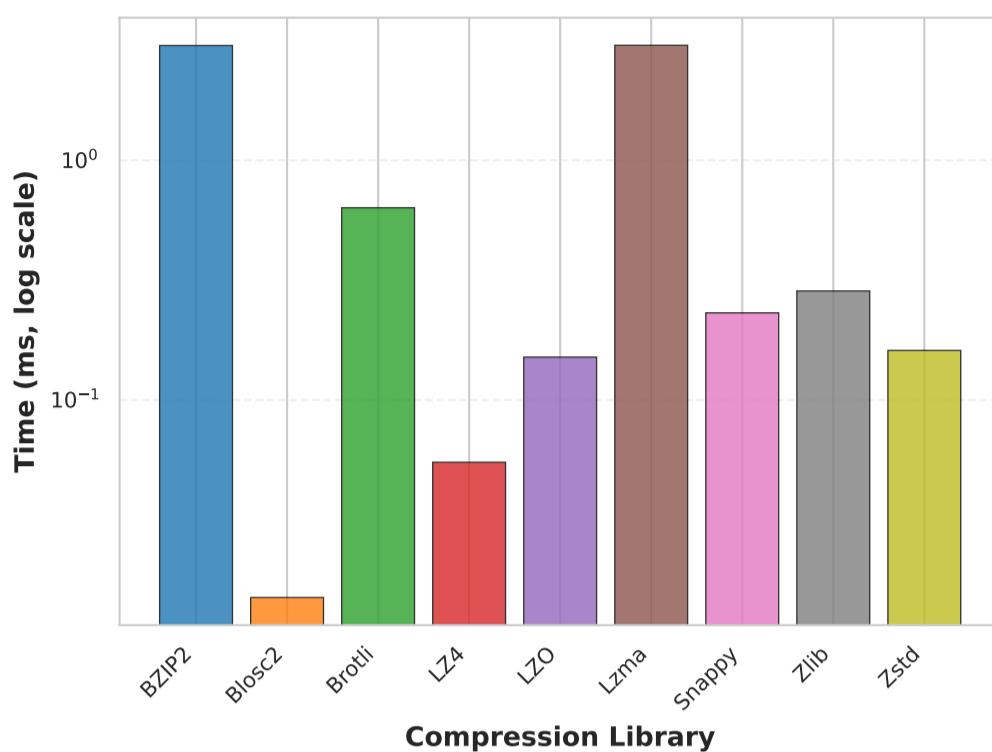
Library	Ratio	Time (ms)	CPU%
Zstd	1.33x	6.1	105%
Zlib	1.32x	1.9	105%
BZIP2	1.32x	5.8	104%
Lzma	1.30x	19.8	104%
Brotli	1.27x	0.6	105%
Snappy	1.00x	0.0	138%
Blosc2	1.00x	0.1	108%
LZ4	1.00x	0.0	134%
LZO	1.00x	0.0	164%

Parameter Study: uniform_7
Max value = 7 (controls entropy/bit usage)
Char Data Type, 64KB Chunk Size
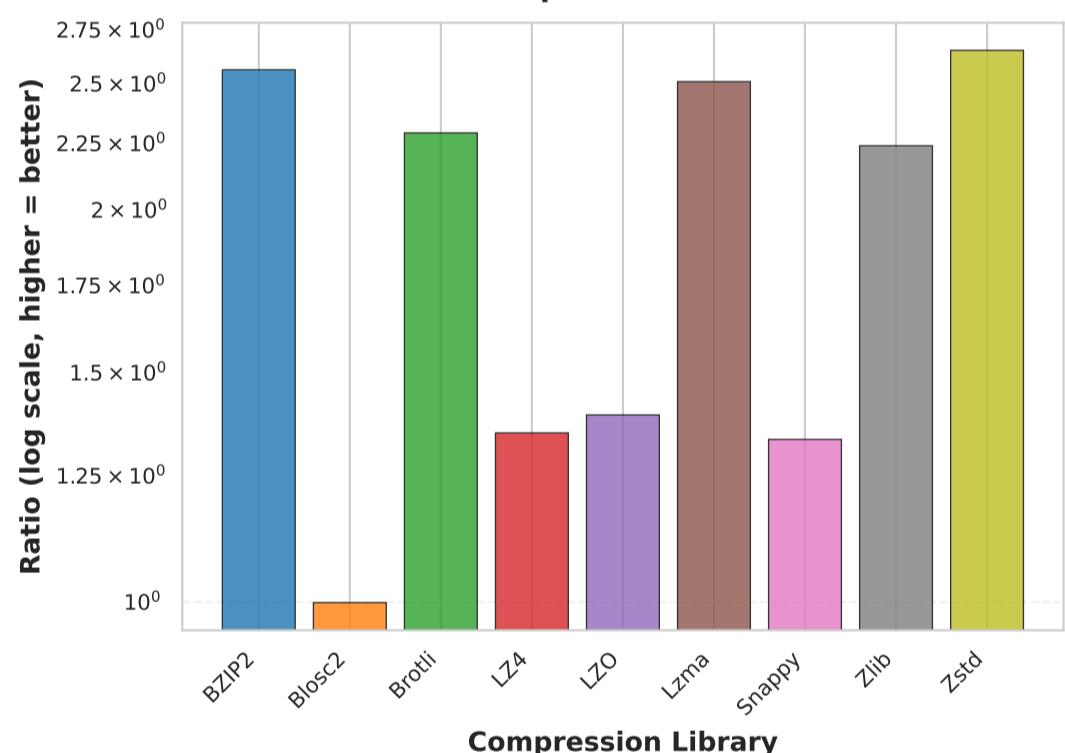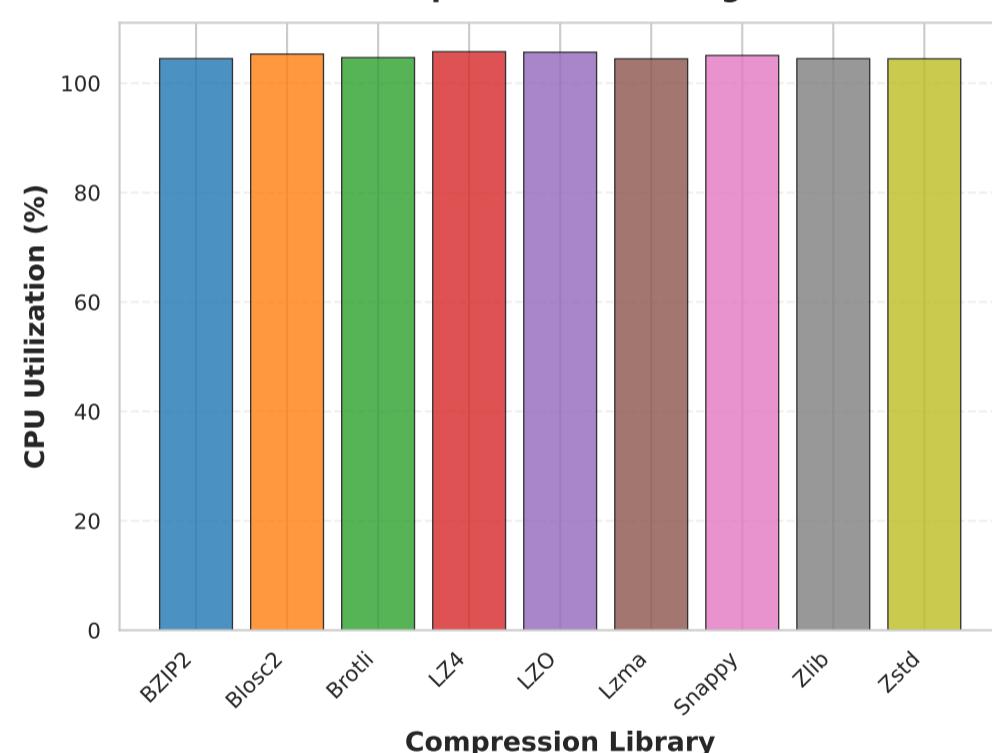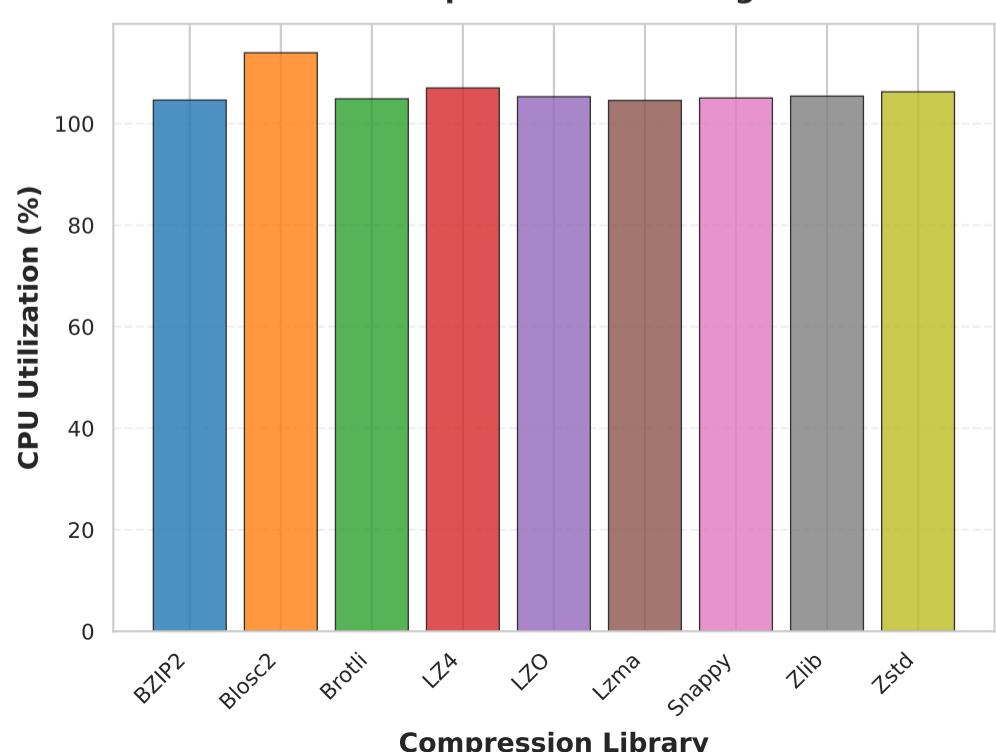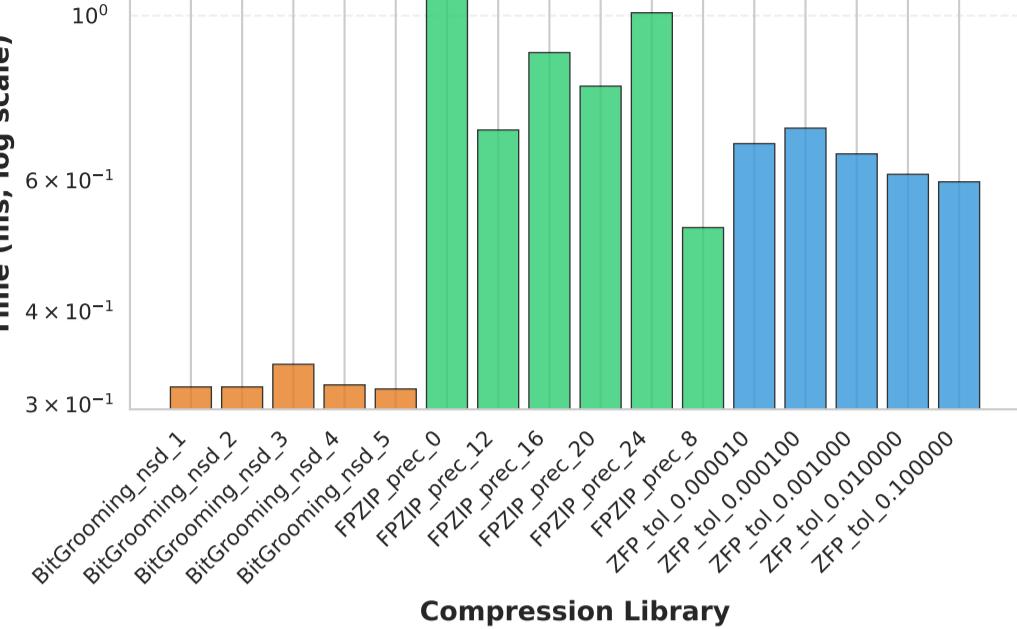
Performance Summary (64KB chunks)
Sorted by Compression Ratio
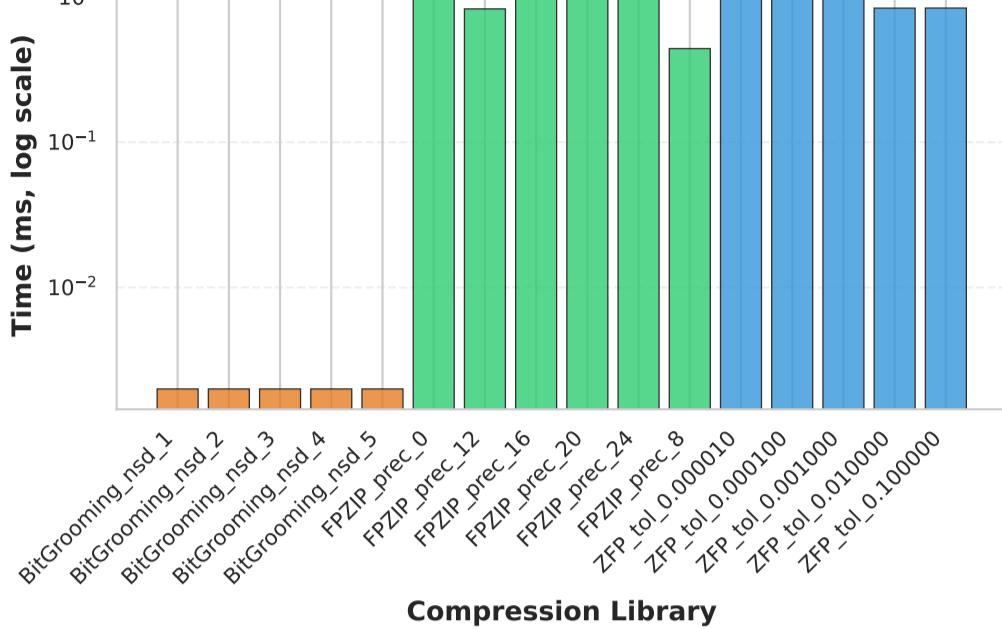
Library	Ratio	Time (ms)	CPU%
Zstd	2.65x	21.7	104%
BZIP2	2.56x	6.7	104%
Lzma	2.51x	19.6	104%
Brotli	2.29x	1.8	105%
Zlib	2.24x	10.3	104%
LZO	1.39x	0.3	106%
LZ4	1.35x	0.2	106%
Snappy	1.33x	0.4	105%
Blosc2	1.00x	0.4	105%

Parameter Study: uniform_float
Float data: Uniform distribution [0.0, 1000.0]
Float Data Type, 64KB Chunk Size
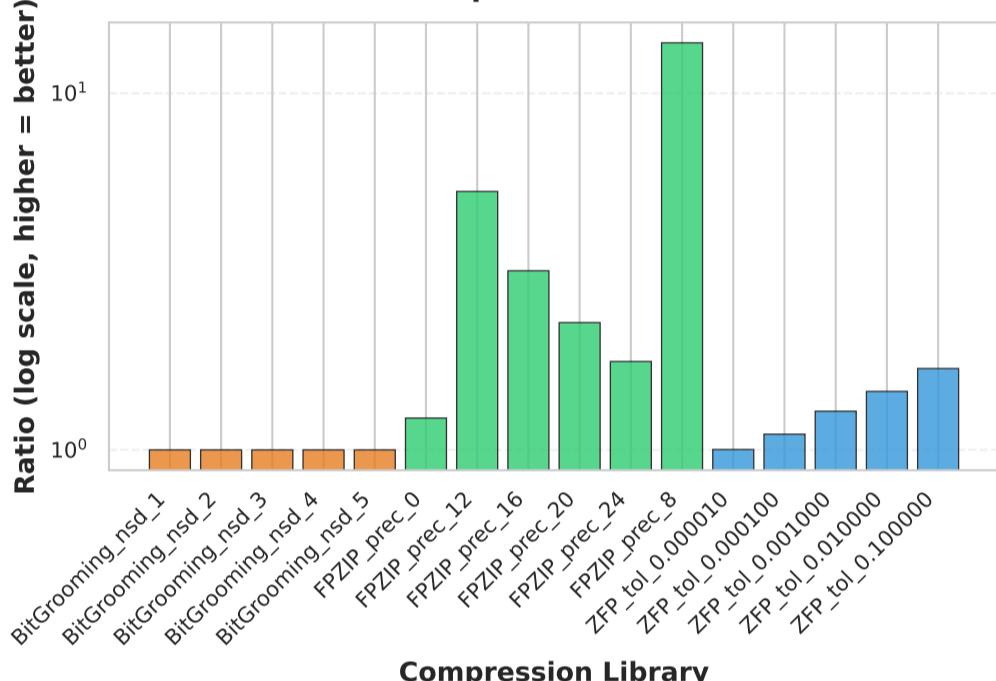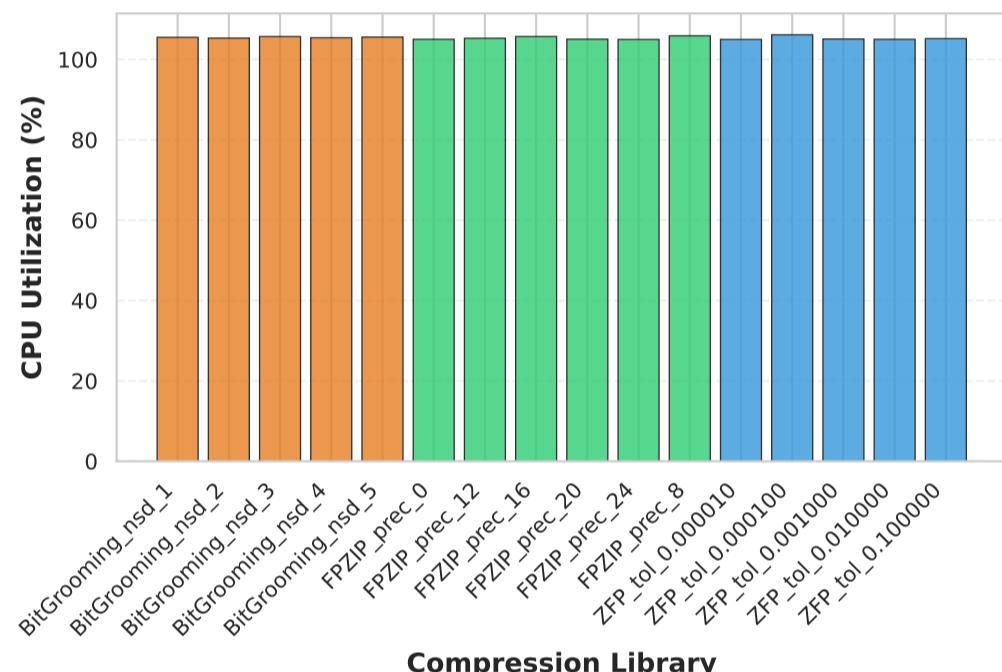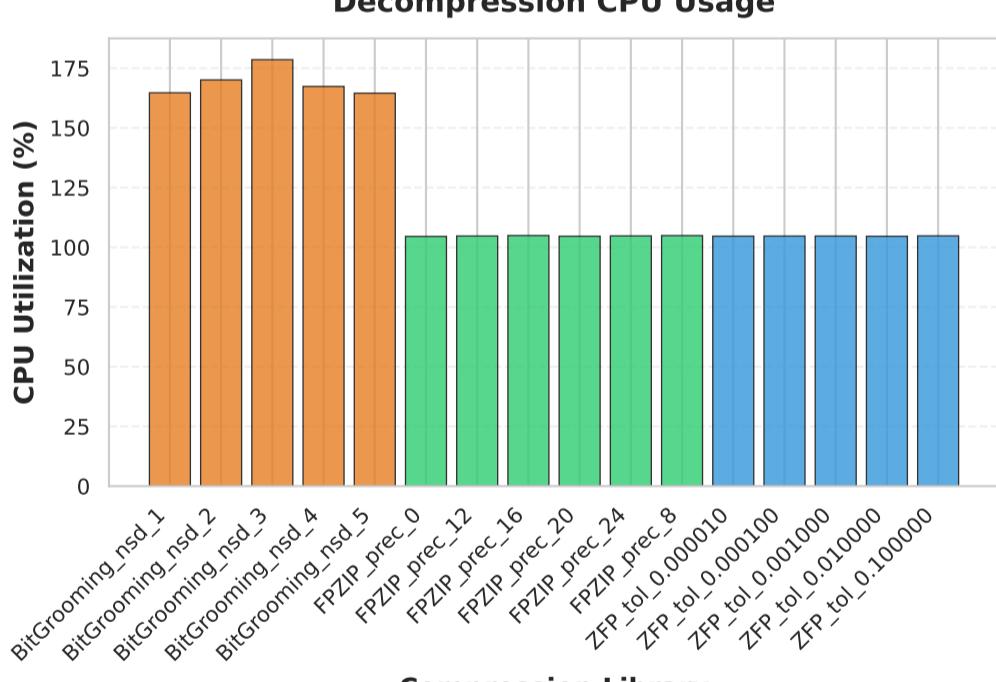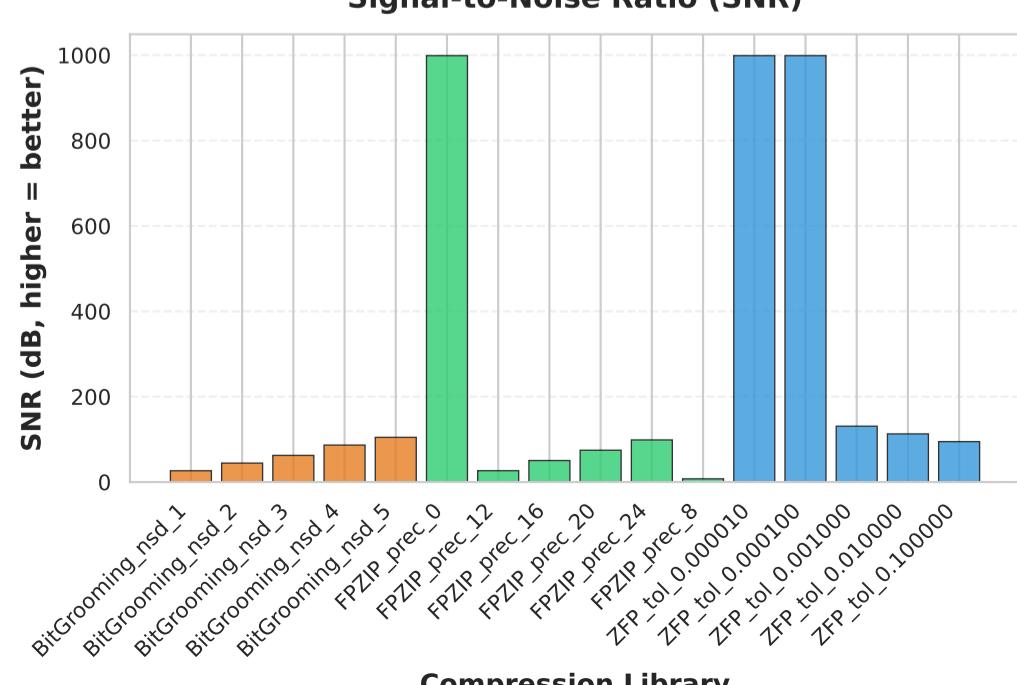
Performance Summary (64KB chunks)
Sorted by Compression Ratio

Library	Ratio	Time (ms)	CPU%
FPZIP_prec_8	13.85x	0.5	106%
FPZIP_prec_12	5.30x	0.7	105%
FPZIP_prec_16	3.18x	0.9	106%
FPZIP_prec_20	2.27x	0.8	105%
FPZIP_prec_24	1.77x	1.0	105%
ZFP_tol_0.100000	1.69x	0.6	105%
ZFP_tol_0.010000	1.46x	0.6	105%
ZFP_tol_0.001000	1.28x	0.7	105%
FPZIP_prec_0	1.23x	1.1	105%